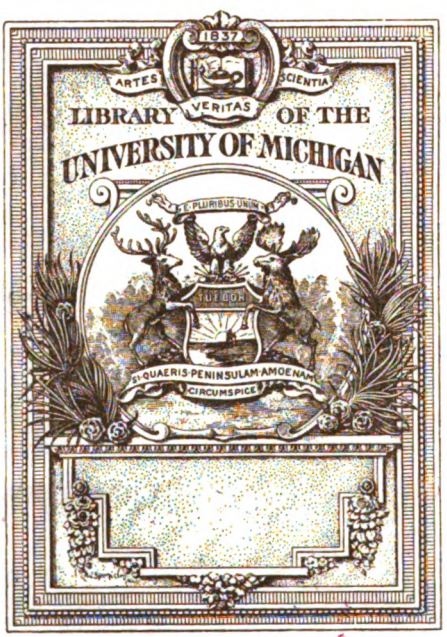

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THE JOURNAL OF
Tropical Medicine and Hygiene

With which is incorporated "CLIMATE"

AND

Embodying Selections from THE COLONIAL MEDICAL REPORTS.

A BI-MONTHLY JOURNAL DEVOTED TO MEDICAL, SURGICAL AND SANITARY WORK IN THE TROPICS

EDITED BY

JAMES CANTLIE, M.B., F.R.C.S.; W. J. R. SIMPSON, C.M.G., M.D., F.R.C.P.; ALDO CASTELLANI, M.D.FLOR.; AND C. M. WENYON, M.B., B.S., B.Sc.

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VOLUME XVII

JANUARY 1 TO DECEMBER 15

1914

LONDON

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* *Note to the Binder.*—These are to be bound to follow all the numbers of The Journal of Tropical Medicine.

Original Communications.

ARTHRITIS IN SPRUE.

By GEORGE C. LOW, M.A., M.D.

Lecturer, London School of Tropical Medicine.

ARTHRITIS is recognized as a complication of dysentery, certainly of the bacterial form, though it is not so clear if it follows the amœbic or other forms of that disease. When one turns to the literature of sprue, however, there is little or no mention of such a condition occurring in that disease.

Carnegie Brown, in his work "Sprue and its Treatment," writes as follows: "Myalgia is a frequent accompaniment of sprue throughout the whole of its course, and especially prominent in the later periods. In the secondary stages the muscles are soft, flabby and atrophied, the effects of failure of nutrition being most apparent in those of the upper arm and calf. With the pain and wasting of the muscles, there is often intense lassitude and weakness, and fatigue is induced by the slightest exertion. The joints, too, are stiff and apparently deficient in synovial fluid, for the patient assumes an arthritic posture, and walks with a prematurely decrepit gait. In the advanced stages of the disease, muscular atrophy is still more general and profound."

The same author has also met with two examples of peripheral neuritis of the lower extremities complicating sprue. Other writers (Manson, Daniels, Castellani) do not mention arthritis or arthritic postures as complications of the disease, and personally, though having seen myalgias and other obscure rheumatic-like pains, I cannot remember off-hand having seen a definite arthritis—unless the one I am about to describe now is one—in the many cases of sprue I have seen and examined.

In the case just mentioned certain joint lesions have appeared, and it is difficult certainly not to associate them in some way or other with the disease, especially so as no other detectable cause has been made out for them. Firstly, however, I shall describe the case in detail and shall then return to the discussion of this point later.

Mr. H., aged 43. India.

History.—Over eighteen years in India. During that time having resided in many different parts of the country.

Previous Illnesses.—Enteric (many years ago), simple continued fever, diphtheria (five years ago), pneumonia (in 1905), mild dysenteric diarrhœa (one or two slight attacks, but not recently).

Present Illness.—The sprue condition came on insidiously, the first trouble being a flatulent distension of the abdomen; the tongue next became irritable and somewhat bared; smoking and drinking making it very painful. After six weeks a little diarrhœa began in the mornings, stools pale, white, and frothy. Dieted himself, but things did not improve. The stools remained loose in the mornings, and the patient also noticed that he had lost considerably in weight.

Examination.—Teeth healthy, no sign of pyorrhœa, tongue not specially bare, a good amount of epithelium still existing upon it, no sores present in the mouth or on the buccal mucosa on day of examination—July 3, 1912. Evidence of loss of weight marked. All the other systems—lungs, heart, &c.—were normal. The abdomen was flabby with very soft walls, no pain on pressure. Liver: 6-7, and costal margin: not diminished in size. Spleen: 9-11. Nervous system: *nil*. Urine: normal. Stools: semi-solid, very pale in colour. Typical sprue character.

Two days after my examination the patient was seized with a severe pain in the abdomen. This began first in the upper segment, and the patient described it as if his stomach was burning. The pain was bad enough to make him roll about, and continued all night; by the next morning the burning sensation had ceased and the patient had more or less regained his ordinary health, though his abdomen on pressure still remained somewhat tender. A strict milk diet was then prescribed, and improvement was noticeable at once. No further pain was complained of in the abdomen, and the stools gradually became solid, and well-formed, though still deficient in bile. About this time a blood examination gave the following count:—

R. 3,970,000
W. 6,200
Hb. 80%
} No parasites of any kind seen.

Differential	Number counted	Per cent.
Polymorphonuclear ...	334 ...	66·8
Large mononuclear ...	14 ...	2·8
Lymphocytes	126 ...	25·2
Eosinophile	15 ...	3
Transitional	11 ...	2·2
Mast cells	0 ...	0·0
	500	100·0

Slight irregularity in the size of the red cells. No poikilocytosis worth mentioning. No basophilia. No nucleated reds.

Progress.—For some time everything went on satisfactorily, but then for no very apparent reason a relapse took place (October, 1912). Strict diet again soon got rid of this, but any slight chill or getting cold quickly brought about a renewal of the symptoms. Another well-marked relapse took place in the summer of 1913. The bowels became loose again with soreness of the tongue and the other typical signs of sprue. From that time until the present the patient has remained more or less *in statu quo*, not having become much worse, but on the other hand not becoming as well as he was before the last relapse.

About the end of May, 1913, slight pains resembling rheumatism began in the right shoulder-joint. By the beginning of November these had become very marked, and the movements of the joint quickly became limited. He saw a surgeon for this about that time and the latter diagnosed that he had adhesions in the shoulder-joint due to septic absorption from the intestine, and advised that these should be broken down under chloroform. This

was not done at once, and the joint quickly became worse, pain being experienced in it even when unmoved, though there was nothing acute visible, *e.g.*, redness and swelling. Movements also had become distinctly more limited, and the case was one evidently for active interference. Chloroform was given and the adhesions were broken down, the patient at the same time being placed on a lactic acid milk diet by the wish of the surgeon. This did not affect the sprue adversely, but on the other hand made no manifest improvement in the joint condition. Passive movements are now being adopted to prevent the adhesions re-forming, and it will be interesting to see whether these do so or not.

Apart from the affection of the right shoulder-joint there have been no other rheumatic pains in the muscles (myalgia), but the patient has certainly been walking lately slightly bowed and with what might be termed an arthritic or decrepit gait. Easily produced fatigue has also been a prominent feature during the course of his illness, the muscles being soft, flabby, and tending to atrophy as has been so well described by Carnegie Brown. As regards the sprue, that condition would seem to be more or less stationery.

It is not perhaps quite correct to term the lesion of the patient's shoulder-joint a pure arthritis, because as far as one can judge the internal arrangements are still in good working order. The changes that have developed would appear to be in the fibrous tissues about and around the joint, namely, in the capsular tissues, and the tendon-sheaths of the different muscles. In these there would seem to have been inflammatory changes of a subacute or chronic nature resulting in the formation of adhesions with a strong tendency to go on increasing and to become progressively worse.

As to the cause of the condition the patient has never suffered from definite rheumatism of any sort before, never rheumatic fever, he is not as far as he knows gouty, there are no signs of tubercle, his teeth are in good condition, no pyorrhœa or any septic lesions existing in the mouth, he has only suffered from gonorrhœa once, long ago in his youth, and at present does not suffer from any form of urethritis, nor are there any signs of syphilis. So far, only the one joint has become affected, though it is quite within the bounds of possibility that others may ultimately become involved as well. The surgeon who broke down the adhesions, as already stated, was of the belief that the trouble had resulted from the bowel condition, he being largely led to this belief by the similarity of the lesions to others he had seen in non-tropical cases of chronic auto-intoxication from the bowel.

The idea of an alimentary toxæmia as the cause of the shoulder condition seems a fairly plausible one, the fact that such lesions follow dysentery favouring this, though on the other hand the apparently extreme rarity of such a condition in sprue is rather against it.

Whether this be so or no, I do not know; but I have reported the case as it seems a specially interesting one, and may help in the elucidation of the etiology of this obscure disease.

Since writing the above I have again seen the patient. His sprue condition is much improved, the tongue now having a good coating of epithelium and the bowels only moving once a day. The stools are solid though still deficient in bile. Weight is increasing again and he feels better.

The joint condition is improved since the operation, movements being freer, but pain is still present, and on rotating the arm there is slight grating within the joint, evidently indicating some involvement of the cartilages. Upon inquiring into the history again carefully, I find that the patient suffered from tonsillitis in his youth, and once did have some rheumatic kind of condition of one of his knees. This might indicate therefore a rheumatic diathesis, but the present condition of the shoulder-joint is certainly not an ordinary rheumatic one nor is it rheumatoid arthritis. As far as one can see, therefore, one must consider it connected in some way with the alimentary condition.

OBSERVATIONS ON THE BREEDING PLACES OF SAND-FLIES (*PHLEBOTOMUS* SPP.) IN THE ANGLO-EGYPTIAN SUDAN.

By Harold H. King, F.E.S.

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Introductory.—Notwithstanding the investigations on the bionomics of the so-called sand-flies, which have been carried out during the last few years, we as yet know comparatively little of the breeding places of these tiny blood-sucking insects. Grassi [1] in Italy found a few larvæ and pupæ in cellars and similar places among damp bricks and refuse. Howlett [2 and 3], working at Pusa, has taken larvæ and pupæ in a number of situations, with but one exception always associated with either stones, bricks, tiles, or cement. Marett [4] and Newstead [5], at Malta, obtained a few larvæ and pupæ in caves and in crevices in stone walls.

Anglo-Egyptian Sudan.—The writer, working in the Anglo-Egyptian Sudan, has unearthed a single larva from soil in a cotton field at Tokar [6] and now wishes to record the taking of a number of larvæ in soil in Khartoum, and the ultimate emergence of the adults under abnormal conditions.

On May 10 of this year, soil was taken from between rows of orange and lime trees, growing in the garden of the Gordon College, and placed in glass museum jars, diameter 8 in. These trees are irrigated by means of water-channels, running from tree to tree down the rows, which are about three yards apart. The soil in the jars was thoroughly

soaked with water and cotton seeds planted in it. On the 17th the jars were netted over and a number of adults of the cotton-flea beetle (*Nisotra uniformis*, Jacquart) introduced. By the 21st the soil had dried out, so it was again soaked with water and more cotton seeds sown, the seedlings from the last sowing having been killed by the beetles. On the 23rd an adult *Phlebotomus papatasii*, Scopoli, 1786, was noticed in one of the jars against the side, about 3 in. below the surface of the soil. It had newly emerged and the empty pupal case was close to it. Examination revealed the presence of several pupæ in similar situations in both jars, and for the next few days fresh pupæ and adults were continually being observed. On the 27th, and for several succeeding days, larvæ were seen. They were mature, and had apparently been attracted to the sides of the jars by the light. Five larvæ and four pupæ were dug out and preserved and between fifteen and twenty adults emerged. The pupal period as observed in two cases was nine days.

It is obvious that immature larvæ must have been present in the soil when it was placed in the jars on May 10, as the first adult was seen only thirteen days later.

As noted above, in Italy, Malta and India the immature forms of sand-flies have almost invariably been taken in association with rocks, stones, or some kind of masonry, and it is generally considered that the female fly prefers such situations as these for the act of oviposition. Doubtless many sand-flies in the Anglo-Egyptian Sudan breed out under these conditions, but the writer is of the opinion that an equally favourite, if not the more normal, breeding place is the soil. He has taken adult sand-flies in crevices in rocks in the beds of streams, and in holes in trees, in the Bahr-el-Ghazal Province and the district formerly known as the Lado Enclave, and in caves in rocky hills some two hundred miles south of Khartoum, but in the northern desert provinces they are sometimes met with in myriads, sufficiently far from any building or rock to preclude the possibility of their having come from it. Tokar is a good example of this. The town of Tokar is the centre of a cotton-growing area of from 30,000 to 40,000 acres watered by a river which comes down in flood during the months of July and August and spreads over the plain. There are usually a few heavy rainstorms in October, November and December. In the town itself one is told that sand-flies are not noticed, but in the cultivation one may find as many as fifteen adults hiding under a single clod of earth. In such numbers do they exist in that locality that anyone who has been there always associates the word "Tokar" with sand-flies. The writer has endeavoured to sleep in the desert, outside the town of Berber, by the dry bed of a small khor (rain-water channel), and found that sleep was rendered well-nigh impossible by *Phlebotomus* spp.

Prophylaxis.—By observations made in these and other localities in the Anglo-Egyptian Sudan the writer is led to believe that in devising any scheme for the destruction of the breeding places of sand-flies one will have to take into consideration all tracts of soil containing a certain amount of moisture and cracks. It is improbable that sand-flies can breed in loose sandy soil which does not crack on drying, as, in the absence of cracks, the pregnant female would be unable to descend to lay her eggs on the damp earth below the surface.

Khartoum,
September 13, 1913.

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[4] P. J. MARETT: "Preliminary Report on the Investigation on the Breeding of Sand-fly in Malta," *Journal of the Royal Army Medical Corps*, September, 1910, xv, 3, pp. 286-291.

[5] R. NEWSTEAD: "The Papataci Flies (Phlebotomus) of the Maltese Islands," *Annals of Tropical Medicine and Parasitology*, vol. v, No. 2, August, 1911. p. 141.

[6] H. H. KING: "On the Bionomics of the Sand-flies (Phlebotomus) of Tokar, Anglo-Egyptian Sudan."

Echinococcus Cyst of Pancreas.—A case of this rare condition is described by Phillips from the Colon Hospital, Canal Zone (*Journal of the American Medical Association*, vol. lxi, No. 22, November 29, 1913). The author gives an idea of the incidence of the condition by a brief review of the literature on the subject. Bergmann dismisses the subject with the statement that "echinococcus cysts of the pancreas have been mentioned, but they occur with great rarity." In Keen is found the following: "Hydatid cysts of the pancreas are extremely rare. Masseron was able to collect the records of only five cases. These were first recognized on the *post-mortem* table. Graham, of Sydney, writes: 'The hydatid is sometimes found in the pancreas. I have observed it as a cyst about 3 in. in diameter replacing the head of the organ.' Tricomi states, without giving references, that 'seven cases have been recorded.'"

So it may be stated that heretofore the condition has been observed seven times, and that at least five of these were found on the *post-mortem* table, and there was no reference made concerning the other two cases.

In Phillips's case the cyst—in the upper part of the body of the pancreas—was found accidentally when operating for a duodenal ulcer. It was drained, and then the cyst wall came away without any trouble. A slight pancreatic fistula persisted for five weeks, but otherwise recovery was uneventful. The patient was a Russian, and in all likelihood got the infection in that country.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 1, 1914.

THE USE OF NEW REMEDIES IN TROPICAL COUNTRIES.

IT is surprising how speedily a newly introduced drug or *rôle* of treatment is taken up by medical men residing in the Tropics; and it is frequently the case that the more distant the colony and the more solitary the doctor is as regards medical neighbours, the more speedily does he begin to use the most recent introductions. When far away from the centre of things medical, the reports of new remedies in the medical journals seem to indicate to the man overseas that "all the world" is using the remedy and that he must not fall behind in the adoption of new and approved agents. In many instances these may be new, but not quite approved except by the individuals who lustily advocate them; still, one finds, in distant parts of the Empire, advanced therapeutic methods are being used long before the general mass of the medical profession at home have even begun to employ them. The fact is that the medical man in isolated regions is on the alert to a degree scarcely understood by "stay-at-homes." His responsibilities are great, grievously great at times; he has no one to call into consultation it may be, and his only guide and counsellor is the medical journal he happens to "take in." Valuable lives are in his hands and he has to do his best without in many cases the consolation of being able even to share responsibility with a fellow practitioner, and certainly without the privilege of expert advice in particular ailments. It is no wonder, therefore, that he flies to the new remedies he reads of, and visitors to the districts find the "local doctor" using remedies freely which were only being whispered about at home. When antipyrin, antifebrin, &c., were first brought into use, travellers were surprised on reaching, say, the Far East to find that the up-to-date remedies with which the medicine cases they carried were equipped were already extensively in use there.

Salvarsan is the latest of our important new remedies to be tried, and in every quarter of the Empire the drug is being employed for a variety of ailments. It is right that it should be so, although apparently neither time nor experience teaches any of us moderation in regard to the remedial possibilities and uses of the most recently introduced remedies. Salvarsan, for instance, has been extensively and wisely used in Fiji in the treatment of yaws, and the Report for 1912, by Dr. G. W. A. Lynch, the Chief Medical Officer, contains a statement by Dr. P. T. Harper, under the heading of "Salvarsan Treatment," in which it is recorded:—

"*Salvarsan Treatment.*—Fifty cases of yaws and syphilis were treated by salvarsan during the year; the number treated by me during 1911 was fifty-one. Of the fifty cases treated during 1912, nineteen were Fijians, thirteen of whom were affected with secondary yaws and six with tertiary yaws. One of these former (an infant, and one of twins), though apparently cured of yaws by the salvarsan, caught dysentery from her elder sister, aged 9, who was admitted to hospital for dysentery, and died of that disease. The death occurred some weeks after treatment with salvarsan, and was not, in my opinion, due to the drug. The twins at the time of treatment were aged about 10 months, and were both in a most advanced stage of yaws cachexia and wasting, and neither of them had a square inch of unaffected skin on their body. The salvarsan cured them in a few weeks. The other Fijians were all cured or much improved by the treatment. Two half-castes and two Samoans were similarly treated for yaws; of one of these nothing further was heard. The other three were cured. Twenty-eight Indians were treated by this drug for yaws or syphilis; one of these, an adult female with rupial syphilis, derived no benefit from the treatment, but got steadily worse. No treatment was of any avail; mercury was tried in many forms and large doses of quinine were given; she died two months after her last dose of salvarsan; my opinion is that in her case the giving of salvarsan was prejudicial. It was given intramuscularly and, in all, she received 3 grm., the first dose being ·6 grm. and the six subsequent doses being ·2 grm., spread over a period of over two months. Possibly this was an instance of anaphylactic reaction. The others all did well. Two of these Indians were suffering from syphlitic keratitis which had obstinately resisted other lines of treatment. They completely recovered

after the salvarsan. All of the above cases of yaws and syphilis which were treated by salvarsan received the intramuscular injection except one, a very bad case of secondary syphilis with an extensive papulocrustaceous eruption, to whom an intravenous injection of ·6 grm. was given; he was cured. As a routine treatment of syphilis I have now adopted a full two years' course of mercury, given by the method of the late Colonel Lambkin, preceded, as a rule, by the intramuscular injection of salvarsan. A number of the Fijian salvarsan cases were treated by native medical practitioner Eroni Buresova, with occasional advice from me. The hospital superintendent at Nausori Hospital was taught to prepare the drug both for intramuscular and for intravenous administration. For the former, various oily emulsions were tried and discarded in favour of the aqueous solution. With proper dosage the risks seem minimal. The risks of giving the drug are certainly not so great as the risks of withholding it in suitable cases. One other case was treated with salvarsan, a case of simple psoriasis; there was no improvement."

The judgment, precision, scientific acumen and attention to practical detail displayed in this report show how our medical brethren abroad keep abreast of the times, and how in the very farthest off of our colonies the ailments of both Europeans and natives are being treated in a manner that bears supreme testimony to the knowledge which our tropical medical schools have served to diffuse and to spread to the most distant parts of the Empire.

J. C.

LIVINGSTONE COLLEGE.

THE Annual Report of the College, issued in November, 1913, shows that this most useful institution continues to do good work. It is twenty years since the College opened and the number of missionaries attending the College has steadily increased. Men from many different denominations and nations have taken out the course of instruction, and as years accumulate the most gratifying tributes are being paid by the old students who have returned to tell the value of the knowledge they had acquired at Livingstone College before going to the mission field. The course of medical and surgical instruction provided by the College extends over a period of nine months, and a better chosen syllabus it is impossible to conceive; and it surely needs no advice to the various religious bodies in our country to see to it that they allow no missionary to go to the mission field in warm climates without first having gained the knowledge which may be the means of saving their own lives and those dear to them; and most certainly will be found to prove the most ready and efficient means of gaining the goodwill and the confidence of the uncivilized heathen folk amongst whom missionaries are to labour.

Many of the religious bodies in Britain plead that they cannot afford to send their intending missionaries to the College before going out; this displays a short-sightedness and a throwing away of golden opportunities for which there is and can be no justification, and involves a waste of capital in life and treasure for which the only apology is ignorance. Religious fervour and devotion all men admire when it is properly directed; but to send out a person to almost certain failure, inasmuch as the natives cannot understand that any emissary of a religious cause is not also a " medicine man," is a mistaken policy and one fraught with danger to the cause he has at heart, let alone the attendant loss of health and life which is almost certain to accrue to the missionary, his family, or those amongst whom he may be cast.

The authorities of the College are endeavouring to raise a Livingstone Memorial Fund of £10,000; a small sum, surely, when it is considered that some £12,000,000 annually are subscribed by the religious communities in this country towards foreign missions. Church buildings are but so much material; without the presence of the clergyman or the missionary they are mere bricks and mortar and must fall into disuse unless the vivifying influence of the pastor is there to advise and help the people. A good deal of money is spent upon an outfit for the missionary, but the best outfit a missionary can be provided with is a knowledge of the kind provided by the Livingstone College.

Dr. Charles F. Harford, the Principal of the College, has declared his intention of resigning his post. This must prove a great loss and is increased to a manifold degree by the fact that Mrs. Harford, the kindly and devoted matron, is also withdrawing from the position she has so long filled with the greatest benefit to the College. Worthy successors will no doubt be forthcoming, but seeing that Dr. Harford was the responsible founder and first Principal, and that the institution has grown and developed under Dr. and Mrs. Harford's devoted attention, their departure is, from an historical and a practical point of view, greatly to be lamented.

Ova in Stools.—McNeill, writing in the *Journal of the American Medical Association*, November 1, 1913, describes an improved method of extracting ova from stools. His technique, which is a slight modification of Yavita's method, is as follows:—

A particle of the stool, about the size of a cherry, is placed in a test-tube. To this are added 5 c.c. of a 25 per cent. mixture of antiformin. This is mixed well and warmed over a flame, but not boiled. Five cubic centimetres of ether are then added and the whole shaken well. It is then filtered through one layer of gauze and centrifuged one minute (water centrifuge). Four layers are formed. In the lower layer the eggs are found.

This method is excellent, also, when dealing with a fluid or semifluid stool. McNeill has found it valuable in detecting hookworm ova in stools, the capsule of the egg not being injured in the least by the mixture, and he believes it is superior to the method which Dock and Bass recommend, as it requires less time, and there is less residue thrown down with the ova.

Abstracts.

PAPERS ON THE DISTRIBUTION OF STEGOMYIA IN INDIA.*

(1) A Stegomyia Survey of the City and Island of Bombay.

By Major W. Glen Liston, M.D., D.P.H., I.M.S.,
and
Sub-Assistant Surgeon T. G. Akula.

Bombay City, the capital of the Presidency and the principal seaport of Western India, is situated on an island in 18° 55′ N. and 72° 54′ E. The island is for the most part flat, and is some eleven miles long by two or three broad. The distribution of the population over the island is irregular, the greatest concentration being found in the south, while the northern portion is sparsely populated. Large docks extend along the greater part of the eastern shores. During the year 897 vessels of 2,358,893 tons burthen engaged in foreign trade entered the harbour. The bulk of the imports are supplied by the United Kingdom, but there is considerable trade between Bombay and the Far East.

The climate of Bombay throughout the year is strikingly uniform, there are no extremes of heat and cold. The climate may be said to be temperate, but is oppressive owing to extreme saturation of the air with moisture during the greater part of the year. The cold season is short, lasting from December to March. The hottest months are May and October. The average rainfall is about 80 in., though there is a considerable variation from year to year with a minimum of about 35 in. and a maximum of a little over 100 in. The rainfall is almost wholly confined to the monsoon months June and September.

The *Culicinæ* survey of the island was begun in the end of July, 1912, and the present review covers the period August and September of that year. The work was undertaken by the authors in co-operation with the Municipal and Port Trust Officers, Drs. Turner, Shroff, and Mr. Lythe.

The larvæ of mosquitoes of the sub-family *Culicinæ* were collected and identified from 922 breeding places where they were found. As will be seen from the accompanying table about 51 per cent. of these mosquitoes belonged to the genus *Stegomyia* and the allied genera *Scutomyia* and *Desvoidea*. The species belonging to these genera were *Stegomyia fasciata* and *S. scutellaris*, *Scutomyia sugens* or a species closely related thereto, and *Desvoidea obturbans*. By far the most common mosquito of this group was *Stegomyia fasciata*. Its breeding places were found 273 times. The proportion of these mosquitoes to others of this group was 59 per cent., or about 30 per cent. of all *Culicinæ* found in the city. The breeding places of this mosquito were distributed all over the island, in the most densely populated part of the city as well as in the more open country or suburbs. *Stegomyia fasciata* showed special preference for certain kinds of breeding places, being found 106 times in wooden tubs containing water, so that this type of breeding place constituted 39 per cent. of the whole. Other selected breeding places and their relative proportion to the whole were cisterns 11 per cent., iron vessels, tin pots, &c., 9 per cent., wells 8 per cent., wooden barrels 8 per cent., cattle troughs 4 per cent., masonry, garden tanks, cesspits, and zinc baskets 3 per cent. The larvæ of *S. fasciata* were more rarely found in the following situations: Broken pots, cups, lily-pots, fire buckets, earthen drinking pots, hollows in iron girders, and other odd receptacles, as shells or antiformicas. In every instance the breeding places were found in what may be called artificial collections of water associated with human habitations. The water in almost every case was clean and free from putrefying material; in this respect this mosquito differs from those described below.

The larvæ of *Stegomyia scutellaris* were found on fifty-six occasions. This species of mosquito constituted 12 per cent. of the *Stegomyia* group, and 6 per cent. of all *Culicinæ* met with. It was not found, like *S. fasciata*, evenly distributed over the island, but was met with in the urban parts only where the houses were surrounded by gardens, and where shade and shelter were available. This mosquito was more commonly found in the suburbs of the city. Like *S. fasciata*, its favourite breeding places were wooden tubs and iron pots; such breeding places constituted about 48 per cent. of the whole. As compared with *S. fasciata* this mosquito exhibited rather a preference for iron vessels. Less frequent breeding places of the *S. scutellaris* were wells, cattle troughs, and occasionally the larvæ were found in such places as broken bottles, cups, flower pots, fire buckets, and antiformicas. It was rarely though occasionally found in pools and ditches filled with rain water.

Scutomyia sugens, or a species closely related to this mosquito, was met with in different parts of the island, especially in the neighbourhood of the new docks. The breeding places of this mosquito constituted 22·5 per cent. of the whole of the *Stegomyia* group.

The breeding places of *Desvoidea obturbans* were found on twenty-nine occasions, forming thus 6·2 per cent. of the *Stegomyia* group. This mosquito was generally found breeding in dirty water coloured brown by organic matter in solution. The larvæ are most commonly found in drains, which are often connected with stables. They have also been found in wooden tubs and hollows containing rain water, in iron girders, and in disused machinery. More rarely they have been found in cattle troughs, masonry tanks, fountains, buckets, cesspits, and roof gutters.

Of the other *Culicinæ* encountered in our survey *Culex concolor* and *fatigans* were the most commonly found. *Tæniorhynchus perturbans* was also occasionally met with. On one occasion larvæ of *Culex mimeticus* were collected, and also a mosquito

* Proceedings of the Third Meeting of the General Malaria Committee, held at Madras, November 18, 19, and 20, 1912. Simla Government Central Branch Press, 1913.

of unknown genus; unfortunately the specimens of this mosquito were so much damaged as to make it impossible to describe or identify them.

It has been clearly established that *Stegomyia fasciata* is widely distributed in the Island of Bombay. It breeds in places closely associated with human habitations where water has been accumulated for domestic use, or where it has collected in disused utensils during rain. The climate and trade relations of the port of Bombay are such as to favour the spread of yellow fever should the ports of the Far East become infected with the disease on the opening of the Panama Canal.

THE BREEDING PLACES OF CULICINÆ FOUND IN THE CITY AND ISLAND OF BOMBAY.

Species	Number of places in which larvæ were found
Stegomyia fasciata	273
Stegomyia scutellaris	56
Scutomyia sugens	104
Desvoidea obturbans	29
Culex concolor	249
Culex fatigans	197
Tæniorhynchus perturbans	13
Culex mimeticus	1
Total breeding places examined ...	922

(2) STEGOMYIA SURVEY—PORT OF CALCUTTA.

By Major A. C. MACGILCHRIST, I.M.S.

Only two species of *Stegomyia* (*fasciata* and *scutellaris*) were met with in the Port of Calcutta. It is noteworthy that *S. fasciata* is found only in densely populated areas. For this reason the term "domestic" as applied to it is not quite appropriate; it is too wide a term. *S. fasciata* is a town or city mosquito; it is not content to live in small villages such as occur on the banks of the Hooghly. In the Port of Calcutta this mosquito has been found only in the densely populated parts of Calcutta and Howrah, and in a small area in Garden Reach. In Calcutta it is a very common mosquito in the northern part of the city, *i.e.*, north of Dhurumtollah Street, including not merely the Indian residential quarter, but also the European commercial quarter and Government Secretariat buildings. By Paiva it has been found common also in the "fringe area" of Calcutta and especially in that part of the "fringe area" adjoining the northern part of the city, *i.e.*, east of Upper Circular Road. It was not found in the villages on the banks of the Hooghly below Garden Reach.

S. scutellaris is exceedingly common throughout the port; it has no objection to either rural or city life. It does not object to live near a solitary isolated hut, so long as that hut is inhabited. While *S. fasciata* is seldom found breeding more than a few yards away from inhabited houses, *S. scutellaris* is often found breeding some 100 yards away. If, in Calcutta, a mosquito is found biting in the day-time, it is almost sure to be one of these two species. The only other species of mosquitoes observed to bite in the day were those of *Desvoidea*.

Only in rare instances have *S. fasciata* and *S. scutellaris* been found in the same receptacle, and at first it was thought they might be antagonistic to each other. Their larvæ, however, when placed together seem to live quite peaceably; the adults emerge side by side.

Favourite breeding places for both species of *Stegomyia* are the broken earthen pots, containing rain water, which are found so commonly around houses.

S. fasciata has been found on the third floor of a house in the northern part of Calcutta in a very congested area. The larvæ are found whenever water can collect inside and in the immediate vicinity of dwelling houses. This species of *Stegomyia* seems to prefer small collections of water; the eggs can resist drying for months. The larvæ have been found in receptacles holding only a couple of drachms of water, which would all evaporate in a very few days. The following breeding places were noted:—

(1) Earthen pots of all shapes and sizes. (This is the commonest.)

(2) Cement and masonry work (next commonest)—

(*a*) Water cisterns about 4 ft. square.

(*b*) Ornamental structures, *e.g.*, in Dalhousie square gardens for holding flower pots.

(3) Metallic vessels—

(*a*) Galvanized iron cisterns, 4 ft. × 4 ft. × 5 ft.

(*b*) Old tin box, 2½ ft. × 1½ ft. × 1 ft.

(*c*) Condensed milk tins—hung up as traps.

(*d*) Kerosine tins.

(*e*) Iron girder placed on its side, water being retained between the flanges.

(4) Household utensils—

(*a*) Enamelled iron bowl.

(*b*) Porcelain flower pot.

The author thinks it strange that he has not discovered *S. fasciata* breeding in wooden receptacles, but this is possibly due to such receptacles not being in very common use in Calcutta for holding water. *S. scutellaris* seems to prefer wooden receptacles next to earthen pots; it was found in—

(*a*) Wooden tube.

(*b*) A hole cut in a log of wood, about 2 in. square.

(*c*) Hollows of bamboo stumps.

(*d*) A coco-nut shell.

Both species lay their eggs singly either on the surface of the water or on the sides of the vessel. The eggs of *S. scutellaris* are only about two-thirds the size of the eggs of *S. fasciata*. Some eggs of *S. fasciata* were dried and kept on blotting paper in an almirah for a month (October-November). When after that period the eggs were placed in water, larvæ made their appearance in less than forty-eight hours.

The larval stage lasts for seven or eight days. The differences between the larvæ of *S. fasciata* and *S. scutellaris* are minute.

The pupal stage lasts two or three days.

Under ordinary circumstances both bite only in the day-time and are most active in the afternoon from about 4 p.m. till it is quite dark. If kept caged all day and fasting they bite at night, even midnight, if they get an opportunity. Under

ordinary or usual natural conditions, none have been caught biting at night.

The species *Desvoidea obturbans* was very common in the Kidderpore Docks and elsewhere. It breeds in foul stagnant water. It bites to some extent in the day-time.

Leucomyia gelida was very common in Calcutta and neighbourhood during August and September; it breeds readily in earthen pots.

Toxorhynchites.—Two species of these giant mosquitoes are found extensively in the port of Calcutta (1) with banded legs, and (2) with unbanded legs. They are rare in the centre of Calcutta, but are common in the suburbs—a probable reason for their avoidance of the city being the absence of succulent trees; they are vegetarians and do not suck blood. They are plentiful on the banks of the Hoogly below Calcutta. As with *Stegomyia* their favourite breeding places are earthen pots; there is usually mud or sand at the bottom of the pot. Their larvæ are seldom found in the same receptacle along with larvæ of other genera; they are usually found alone and generally in very small numbers—only from one to four specimens in each receptacle. The reason is that the larvæ of *Toxorhynchites* are carnivorous and eat up the larvæ of other genera, and in the absence of larvæ of another genus they eat one another, the largest and strongest larvæ surviving. The adults apparently do not bite man or suck blood.

A larva of *Toxorhynchites* can kill larvæ of *Stegomyia* three or four times its own size, and can easily dispose of half a dozen good-sized larvæ of another genus in about half an hour.

(3) Notes on Distribution and Habits of Stegomyia Mosquitoes in Madras.

By Captain J. H. Horne, I.M.S.

The following notes were based on a three weeks' survey undertaken in order to find out, for the purposes of the Conference, the species, distribution, and habits of *Stegomyia* mosquitoes in the town of Madras. The original scheme for a *Stegomyia* survey of the main Madras ports has not yet been sanctioned, and these notes cannot be taken as in any way representing the results of a complete survey.

Species.—Two species of *Stegomyia* occur here, *viz.*:—

(1) *Fasciata*.

(2) *Scutellaris*.

Fasciata is the more widespread of the two, and is essentially a house mosquito; *Scutellaris* is common where there are trees, and is, in Madras at least, apparently an outdoor mosquito.

I. *Stegomyia fasciata*.—Its breeding places may be classed as follows:—

(1) All sorts of *receptacles* containing water, *e.g.*, earthenware gurrahs (by far the commonest), tins, tubs, flower pots, fire buckets, pails, mill stones, &c.

(2) *Drains*, open and underground.

(3) *Wells*, surface and deep; both indoor and outdoor.

In receptacles they were usually found along with *Stegomyia scutellaris*, *Scutomyia sugens*, and *N.M. rossi;* less often with *Culex fatigans* and *Tæniorhynchus*. As a rule these receptacles were lying about in compounds, but were sometimes in very exposed places, *e.g.*, flower pots on the roof parapets of two-story buildings.

It is only in the harbour that the larvæ have been found to occur in drains; and here the mosquito is so abundant as to constitute a serious hindrance to work in the offices and goods sheds.

The larvæ were taken—

(1) In an open cement drain round the goods office.

(2) In a covered underground drain round a loading shed.

The latter drain was roofed over with stone slabs, between which were numerous chinks and spaces permitting easy access to the water below.

No *Stegomyia* larvæ have so far been got in the drains in the town.

Their presence in wells was first detected in a "deep" house well in Georgetown, so dark that the surface of the water could only be seen with difficulty. Further search revealed them in an outdoor well ("deep") in a neighbouring compound; and again in a surface well in an open space in another part of the town. The chances are that their presence in such wells is widespread. The first well was in use, the others were not.

In these wells they were found along with *Neoc. "stephensi"* and *Culex fatigans*.

Stegomyia fasciata larvæ were not found in open pools, ditches, or bamboo stumps.

The adult *S. fasciata* were almost all caught inside houses and always in the close vicinity of a breeding place. Only a very few were caught in sheds, stables, and gardens. Their presence in huge numbers in the harbour goods "sheds" seems at first to contradict this statement, but these sheds are closed buildings and contain large numbers of coolies during the day.

As regards their well-known habit of biting by day, coolies in the harbour sheds said that the worst time was from about 9 to 12 in the forenoon, and that after that they gave little trouble.

In the Madras Club the author himself has been bitten between 7 and 10 p.m.

II. *Stegomyia scutellaris* has been found breeding in—

(1) *Receptacles* containing water, *e.g.*, earthenware gurrahs and flower pots.

(2) *Bamboo stumps*, and always close to trees.

They have not been taken in drains or wells or open pools.

Not a single adult has been caught inside a house or hut of any sort, even when their larvæ were within 6 ft. of the door.

In gardens, both large and small, they are fairly common, and here are easily captured owing to the persistence with which they attack one. In Pusa this species was a household pest, and it is likely

that, though here they apparently keep closely to gardens, they venture into houses for blood. Still it is worthy of note that in one Paracheri where they were very numerous the inmates made no complaint whatever of mosquitoes biting them.

In addition to *Stegomyia* the following were found:—

(1) *Desvoidea*, the larvæ of which were found together with *Culex fatigans* in a surface well near the sea. Adults were taken in neighbouring houses.

(2) *Scutomyia sugens*, whose larvæ were found in earthenware gurrahs together with *Stegomyia scutellaris*.

(3) A genus of mosquito which appears to be a *Reedomyia*, but this requires confirmation.

Adults of these genus were taken in a wood in Nungambakam; its larvæ were not discovered. These three genera are closely related to *Stegomyia* in scale structure, and resemble it in their vicious habit of biting by day.

ERADICATION OF MALARIA.*

By C. C. Bass, M.D.
New Orleans.

Eradication of malaria from the United States would not appeal to those who have not given the subject special thought as within the bounds of possibility, but Bass is confident that many at a meeting recently held in Norfolk, Virginia, left with the conviction that it was quite possible and actually could be accomplished in a short time. Though such an undertaking would require considerable funds, there is no doubt that this would be promptly offered by some philanthropist, if the facts or possibilities were known to him. It is quite possible that, properly undertaken, a great deal more could be accomplished in the saving of lives and resources of the country, that are now wasted by this important disease, than in the instance of the less destructive hookworm disease.

Bass then recounts some of the suggestions made by those who addressed the Conference. Before doing so he states some of the fundamental principles and facts relating to the transmission and treatment of malaria. These are well known to those familiar with the subject and need not be repeated here.

All that is required for the complete eradication of malaria in the United States is for everybody who has malaria during a warm season to take the proper amount of quinine on each of two consecutive days in each of six consecutive weeks during the following cool season.

If this statement could be brought with sufficient authority to the attention of all the people, and if the importance of everybody's co-operating could be emphasized, the writer's belief is that a vast majority of the malaria carriers would follow the advice given.

Regardless of the most thorough dissemination of this information and the most perfect co-operation, no doubt a few cases of malaria would occur during the warm season. These cases are not a source of infection to mosquitoes until the disease has existed about two weeks. It is very important that thorough and successful treatment of such cases should be applied before they become infectious. Six weeks of proper taking of quinine would ensure the harmlessness of these cases. It is important that the laity and also the medical profession should know these facts. Eradication of malaria becomes in fact, therefore, a question of education. Perhaps it may be better said to be a question of dissemination of a very few very simple facts and the co-operation of the entire population to benefit by the knowledge of these facts.

The laity is generally ready to accept and fully appreciate such information provided it is simply stated and not overdone or exaggerated.

A very large part of the population could be reached through the public schools. The important facts relating to the prevention and treatment of the disease could be stated on one, two, or three pages of some text-book, like, for instance, the Third or Fourth Reader. This could be prepared in the form of a lesson. It should also meet the approval of some such authority as the Commission for the Study and Prevention of Malaria of the Southern Medical Association. The lesson could be simple enough to be within the grasp of all students above the fourth or fifth grade.

If funds were available and the co-operation of the superintendent of the public schools of a state was given, he would forward to each teacher in the state the necessary copies of the lesson, and *direct* (not suggest) that each student be taught the lesson thoroughly, just as other lessons are taught. It should be taught in all grades above a certain limit and probably should be reviewed during each term. Teachers would naturally learn the lesson by teaching it. Many of the children would carry the lesson home to their parents and talk about it at home. No doubt many children and families would take pride in having carried out the instructions and in not being a source of infection.

Another way by which a great deal could be accomplished is through corporations and employers of labour, such as railroad companies, plantation and manufactory managers, &c. Personal and financial interest in such instances would be sufficient to lead to important results if the real truth was known to those concerned. If a plantation or mill manager realized the menace to the health of his employees and even to himself and family, and the actual financial loss from insufficient service that might result from a single case of malaria, his interest would be excited. He would likely see that the person took proper treatment, if he knew what it was. He could require that proper treatment be taken to protect the balance of the force.

The medical profession would be supposed not to require further education on so simple a subject as malaria; but actually it does. It is true that all

* *Insterstate Medical Journal*, vol. xx, October, 1913, No. 10.

the best medical schools in the South now give their students fairly thorough instruction in malaria, but it must be remembered that a good many members of the medical profession in the South were educated in Northern or other schools, and that the majority were educated several years ago when instruction in all branches was inferior to what it is now. No doubt co-operation of schools in malarial sections could be secured to the extent that all would in the future thoroughly instruct their graduating men in the diagnosis and treatment of malaria. They should all know that it is an important duty to their malarial patients to instruct them that, in order to become completely cured and to prevent infection of others or relapses in themselves, they should take quinine properly for six weeks.

Medical licensing boards could materially assist in ensuring proper training in malaria, by regularly asking, on examination for licence to practise medicine, a comprehensive question on malaria. It might be well if it was generally known that such a question or questions would be asked on every examination. An applicant would then be sure to prepare himself on the subject.

This proposition to give special prominence to this one disease by medical schools and medical licensing boards in the South is justified by the fact that malaria is perhaps the most common and important disease they will meet in practice. Because of its great prevalence it is to be considered and, therefore, diagnosed or proved absent in almost all cases of fever and in many other conditions.

Effort to eradicate the disease along the educational lines suggested would meet with two serious obstacles. First, there would be a few infected people who would not follow the advice given either because they think they know more about the disease than the scientists who have studied it for years, or because they have not enough concern and care for the health and life of themselves and others to take proper treatment. The question would arise whether such persons should not be managed as those who have small-pox, yellow fever, diphtheria, &c. They should be segregated until they are no longer a menace to the life and health of others. The second important obstacle would be the importation of cases of malaria from other countries. In the event that America should get sufficiently free from the disease there would be the same reason for preventing others from bringing infection into the country as there is for quarantine regulations against introduction of yellow fever, trachoma, &c. As a further protection to the reintroduction of malaria from nearly all tropical countries it might be possible to carry the propaganda of education against malaria to these countries, and thus assist them materially to check the ravages of the disease. The danger of importation into the United States would thus be very much reduced.

NOTES ON LIFE ASSURANCE IN EGYPT.*

By Harold Benjamin Day, M.D., M.R.C.P.

Life assurance is gaining increasing popularity in Egypt with the spread of European institutions and the establishment of local offices offering terms as favourable as those in Europe.

Proposers are of all nationalities, and present very different problems to the medical examiner. Four main classes may thus be distinguished:—

(1) The Western European.

(2) The native of Southern Europe.

(3) The Eastern races, chiefly composed of Syrians and Armenians.

(4) The native Egyptian.

The risks of the Egyptian climate nowadays to British residents are often no greater than those encountered at home.

The only serious endemic diseases that attack the European resident are typhoid fever, with its congeners, and dysentery. The possession of trained servants and the habitual observance of due precautions are necessary safeguards against oral infections, while the rapidly growing practice of typhoid vaccination has diminished the incidence and virulence of this disease. It follows that the man stationed in Cairo or in one of the large towns is a better risk than an inspector, for instance, whose work takes him to distant villages. In general, therefore, the average British resident is a good risk.

(2) The largest assurance business done by British offices in Egypt is among foreigners of more or less mixed nationality. As a general rule, the purer the nationality the safer the risk. Such persons are readily acclimatized, but are less careful of their health than the average Englishman.

(3) The more Egyptian type, such as the Syrian, may be classed as intermediate between the foregoing and the native Egyptian.

(4) The native Egyptian forms the smallest, but an increasing proportion of those seeking life assurance. The difficulty of accepting such lives in the past has been considerable, and most offices will not offer whole-life policies.

The proposer may be ignorant of his real age, or may be unable to offer any proof of it. This difficulty may be solved by offering insurance for a limited term. Alcoholic intemperance is very rare among all classes of Egyptians—Christians as well as Moslems. As a set-off, however, sexual excess and immoderate cigarette smoking are common, although not so prevalent as formerly.

The common diseases of Western Europe are equally important in Egypt. Of these, rheumatic fever, tuberculosis, and syphilis—the three most important for life assurance—are as frequent as at home. In contrast with the European resident, the native adult has little susceptibility to typhoid, since he is commonly protected by an attack during infancy or childhood. Appendicitis and carcinoma

* Paper read before the Life Assurance Medical Officers' Association on May 7, 1913.

are still relatively uncommon compared with their incidence in England; diabetes is certainly more frequent.

Most " tropical " diseases are endemic in Egypt, but are largely avoided by personal cleanliness and sanitation. Ankylostomiasis, pellagra, splenomegaly (Banti's disease), relapsing fever, and typhus, although common among the peasantry, rarely attack a member of the upper classes.

In boyhood, bilharziasis is often contracted, but the severe cases are only seen in those workers who are exposed to repeated reinfection. A slight lesion of the bladder wall, accidentally revealed on microscopical examination of the urine, but without obvious hæmaturia, does not endanger nor shorten life, provided the risk of a fresh infection be excluded. If all the ova seen be calcified, proof is at once afforded that the disease is of old standing. Should blood be present in sufficient amount to cause albuminuria, it is safer to refuse the life, since the amount of hæmaturia is roughly proportional to the intensity of the infection. After the lapse of two or three years such a case may lose his symptoms and become insurable. The danger of bilharziasis is the risk of septic complications, hence all cases showing intestinal symptoms should be refused. Attacks of renal colic in Egypt are frequently due to bilharzial disease of the ureters, without the presence of calculi, and may be the sole symptoms of this infection. Provided the attacks have not recurred since early manhood, and no signs of bilharzial disease remain, such cases may be accepted.

The question arises: Are the prospects of longevity the same for the native Egyptian as for the average European? Judged by the standard of hygiene and sanitation, all Eastern countries, including Egypt, fall much below the British standard. Ignorance and superstition not only levy a heavy toll on infant life, but are prejudicial to the health and longevity of adults. Illness is often mismanaged until effective treatment is difficult, while skilled nursing is rarely requisitioned. A great change, however, in the habits and health of the native population is already apparent in the upper classes, due to the spread of European ideas. Education and sanitation are rapidly extending their influence from the pupil to the home, and the best native families are the equals in health of the European.

For practical purposes, therefore, we may take the infant mortality in the proposer's family as a useful index of health. In this connection it is more important to inquire after the history of each child born to the proposer (since he is generally a married man) than to trace the family history of his brothers and sisters, for records of early deaths are often unobtainable. Such facts are a ready indicator to the hygiene of his house, and therefore to the prospects of his longevity—a point to which sufficient importance has not been attached in the printed report. A proposer, then, in good health, whose education has been sound and way of living satisfactory, and whose children are successfully reared, may be accepted for a whole life on European terms. On the other hand, a man of Eastern race whose life does not conform to the European standard of hygiene is best offered a fixed term.

VERRUGA PERUVIANA, OROYA FEVER AND UTA.*

By Richard P. Strong, M.D., E. E. Tyzzer, M.D., Charles T. Brues, S.M., A. W. Sellards, M.D., and J. C. Gastiaburu.

The expedition was undertaken for the purpose of investigating certain obscure forms of tropical disease in South America, particularly verruga peruviana, as well as with the idea of collecting material to be used for the instruction of students in the various courses of tropical medicine to be inaugurated at Harvard University in November of the present year. After proceeding to Colon and Panama the members of the Commission continued down the west coast of South America to Buenaventura, Colombia, and thence to Guayaquil.

From Guayaquil they proceeded to Peru, where at Lima, and in a number of the mountain towns in the interior, the major portion of the work of the expedition was carried on. In Peru the diseases particularly investigated were verruga peruviana, Oroya fever and uta.

Verruga Peruviana and Oroya Fever.

From the remotest historical times the inhabitants of Peru are said to have suffered severely from this obscure disease. Over four centuries ago, during the reign of Inca Huayna Capac, thousands of lives were swept away, supposedly from this malady; and it is related that during the sixteenth century a quarter of the army of Francisco Pizarro perished from it. References may be found to the disease in Peruvian writings of the seventeenth and eighteenth centuries, and from 1843 to 1871 a number of additional papers relating to it were published, among which may be particularly mentioned those of Odriozola in 1858, and of Dounon in 1871. In 1870 a severe outbreak of fever took place among the workmen building the Central Railway between Lima and Oroya, and it is estimated that at least seven thousand lives were lost in the verruga zones. At this time the complaint received the name of " Oroya fever," although it appears that it was not contracted in Oroya itself. In 1906, out of a force of two thousand men employed in tunnel work for the Central Railway, two hundred are known to have died of the disease. Previous to 1885 there ensued some discussion as to whether Oroya fever and verruga were related to one another, or whether the latter was a distinct disease. On August 27, 1885, Carrion, a medical student in Lima, and a native of Cerro de Pasco, Peru (a town situated in the mountains far above the localities in which the

* " Preliminary Report of the First Expedition to South America from the Department of Tropical Medicine of Harvard University," *Journal of the American Medical Association*, vol. lxi, No. 19, November 8, 1913.

disease abounds), attempted to solve this problem by vaccinating both his arms with blood from a verruga tumour. It is related that twenty-three days later he began to suffer from Oroya fever, from which he died, October 5. From this experiment the conclusion was drawn by Peruvian physicians that verruga and Oroya fever were only different stages of the same disease, and this is the opinion which has been held by practically all of them up to the present time. In honour of Carrion's attempt to throw light on the nature of the disease, the febrile condition which has been regarded as the first stage of the malady is now generally known in Peru as "Carrion's fever." Although it has been stated that Carrion during his illness kept notes, and gave a minute description of his symptoms to his companions, unfortunately it appears that none of these were preserved and published. No accurate record of Carrion's case is available, and no necropsy was performed. It has been asserted since that he died of typhoid fever or of a more acute form of septicæmia.

In 1901 and 1902 Barton performed extensive bacteriologic investigations, and concluded that in the blood and organs at necropsy of persons dying from Carrion's fever a bacillus was present which, though similar to *Bacillus coli communis*, could be distinguished from it. The organism was said to cause either a fatal septicæmia in animals, or a verruga-like eruption of the skin. Biffi and Carbajal and Tamayo and Gastiaburú investigated this bacillus, and reported that it was present constantly and in abundance in persons suffering from Carrion's fever, and was agglutinated by their serum, but was absent from persons suffering from verruga peruviana without fever, whose serum also showed no agglutination of this bacillus. They were unable to confirm Barton's results as to the production of a skin eruption by the bacillus, and concluded that it was not the specific agent in Carrion's disease, but was a secondary invader in verruga, and gave rise to the symptoms of a form of typhoid fever, which disease constitutes the *fiebre grave* of Carrion. In 1903 Biffi and Gastiaburú noted in stained preparations of the blood the presence of granules in the red blood cells which stained readily with the basic aniline dyes. The form and structure of these bodies was that of a coccobacillus or of irregular granules. In 1905 Barton described in the red blood cells of two persons sick with severe malignant fever elements similar in morphology to bacilli. In 1909 he noted the presence of these elements in stained blood specimens in fourteen additional cases and expressed the belief that they were protozoa and probably the specific agent of the infection. In 1909 Gastiaburú and Rebagliati observed the same bodies, and stated that they were probably protozoa, and might be regarded as the pathogenic organism in Carrion's disease. Later, Mayer, Gastiaburú and Rebagliati, Monge and others have been inclined to believe that the bodies described by Barton were products of cell degeneration.

According to the generally accepted opinion among the physicians of Peru at the time of the Commission's arrival in Lima, the disease verruga peruviana in the severe type begins with an initial stage known as the *fiebre grave* of Carrion, which is characterized by a fever which lasts from fifteen to thirty days, profound anæmia, prostration, and a high mortality. If the patient does not die in this stage the fever begins to abate, and the eruptive, or verruga, stage commences. If the eruption is generalized and abundant, then it is stated that the patient is sure to recover. In the chronic or mild type of the disease, which is said to comprise the great proportion of the cases, there is moderate fever of intermittent or remittent type, and pains in the joints are common; more or less anæmia is also present. The eruption is said to be the culminating phase in both forms, and it appears under various types which, according to the special characteristics they reveal, are termed "miliary," "nodular," or "mulaire."

The investigations of the Commission concerning the etiology of verruga peruviana and of Oroya fever were carried on in the Municipal Laboratory of Hygiene, in the hospitals of the city of Lima, in the mountain towns of Santa Eulalia, San Bartolomé, Surco, Cocochacra, and Matucana, and in the vicinity of these towns. From these investigations it was concluded that verruga peruviana and Oroya fever represent two distinct diseases. The former is due to a virus which may be transmitted to animals by direct inoculation, and which produces definite lesions in them, whereas the latter is due to an organism parasitic in the red blood corpuscles sufficiently distinct from the other hæmatozoa to be placed in a new genus. So far this organism has not been successfully transmitted to the lower animals. The parasite which is the cause of Oroya fever produces in man fever and in severe infections a rapid and very pernicious form of anæmia, which results in extreme prostration and frequently in death. At the necropsy of a case, in addition to the evidences of a very severe anæmia, the spleen was enlarged and showed hæmorrhagic infarctions. No other organism to which death could be ascribed was found present. In this uncomplicated case there was no eruption of verrugas. Both intravenous and intratesticular inoculation of rabbits, as well as intravenous inoculation of a monkey, with large amounts of defibrinated blood from severe Oroya fever cases did not produce any noticeable results; and the parasites observed in the blood in the cases in man were not found in the blood of the inoculated animals. The parasites were observed in the blood in the cases in man both in fresh and in stained preparations.

Fresh Blood Preparations.—Although in fresh blood preparations the organisms are frequently difficult to detect, and at times appear to lie deep in the substance of the red blood cells, nevertheless with good illumination and an oil-immersion apochromatic objective, they may at times be distinctly observed. In form they are rounded or rod-shaped, though the rods are not always straight in outline. The rods measure approximately from 1·5 to 3 microns in length, and the rounded bodies from 0·5 to 1·5 microns in diameter. In severe infections, red corpuscles in almost every field of the microscope

are invaded by the parasites, and numbers of both rounded bodies and bacillary forms are frequently observed in a single cell. The organisms are endowed with definite motility, which amounts to slow transition, and is totally distinct from that of pedesis. The rod-shaped forms have been observed to glide slowly in the direction of their long diameter, and to exhibit a slight bending. On account of their small size the rounded bodies are more difficult to describe in fresh specimens, and it can only be stated that they change their position within the cell.

Stained and Fixed Preparations.—The rod-shaped forms measure approximately from 1 to 2 microns in length and from 0·2 to 0·5 microns in thickness. They are usually curved, and occur singly or end to end in pairs, or in chains of three, four and five. V forms, probably representing dividing organisms, are frequent. When numerous they often lie parallel to one another. Cross forms are rare and may be due to organisms being superimposed; Y forms are also infrequent but not numerous. The ends of the rods in stained preparations are intensely coloured. Single free rods show a deep red or purplish granule which may be of the nature of chromatin and gives the appearance of a swelling at one extremity, the rest of the rod having a more bluish tint, sometimes deepest at the opposite end. Other rods may be blue throughout or have the deeply stained granule at both ends, while others are beaded with blue or deep reddish granules.

The rounded forms are roughly from 0·3 to 1 micron in diameter, the larger ones being considerably thicker than any of the rods. The greater proportion of these, although rounded, are slightly oval or pear-shaped; some are considerably larger than the rods, and the deeply stained granule is proportionately larger and is likewise differentiated from the more blue-tinted cytoplasm. They occur singly or in groups which suggest previous division.

The red cell may contain from one to as many as thirty of the above-described elements. Nucleated red cells at various stages of development may also be found infected. From the anæmia which occurs in this infection, it is to be presumed that the red cells containing the parasites are ultimately destroyed.

The authors believe that the organism possesses some of the characteristics described for the *Anaplasmata* or of the *Theileria*, but also differs widely in some respects from the characteristics described for each of these genera. The rounded bodies resemble the *Anaplasmata* in their form and size and in the fact that they apparently consist entirely or almost entirely of chromatinic substance. Although the bacilliform or rod-shaped bodies predominate, their appearance and staining reactions are considerably unlike those of the rod-shaped bodies observed in the *Theileria*, and cross forms have not been observed. Moreover, their movements are unlike those of the *Piroplasmata*. While the organism at first sight may be regarded from its morphology alone as a species of bacterium, this idea is not supported by further study. It is essentially a parasite of the red blood cell; attempts to cultivate it on various culture mediums have been unsuccessful and the inoculation of large amounts of blood from a severe case of Oroya fever has failed to infect a monkey or rabbits.

From the present evidence it would appear that the organism in the blood in Oroya fever belongs to a group of micro-organisms intermediate between the protozoa and the bacteria, just as perhaps the spirochætes form another such group, and the authors propose the name of *Bartonia bacilliformis* for it.

Verruga Peruviana.

Verruga peruviana is a disease particularly characterized by an eruption on the skin and occasionally on the mucous membranes of the mouth and throat. The lesions present great variations in appearance. The distribution of the cutaneous eruption resembles somewhat that seen in yaws; but in many other respects the lesions of the disease are entirely distinct. In uncomplicated cases, neither the parasites of Oroya fever nor those of malaria are present in the blood; though as verruga peruviana is contracted in regions in which Oroya fever and malaria are common diseases among the inhabitants, and visitors are likely to contract such maladies, it is not surprising that concomitant infections with these parasites frequently occur.

It is quite evident, according to the Commissioners, that verruga peruviana represents an entirely distinct disease, and that it is not a form of framboesia or of syphilis. The disease owes its origin to a virus which produces characteristic local lesions in rabbits' testicles. The incubation period varies in rabbits from ten to twenty-two days. So far fifteen rabbits have been successfully inoculated, and the virus is now in its third transplant in these animals. In dogs and monkeys, cutaneous and subcutaneous, and sometimes intraperitoneal inoculation has given rise after from eleven to seventeen days to localized lesions, which sometimes resemble closely those observed in man.

Uta.

Uta is a disease which has existed in Peru since prehistoric times. It has been stated by various authorities that the disease represents a form of syphilis, or one of prehistoric leprosy, or a special form of lupus vulgaris. The Commissioners were able to show, however, that the disease is really due to a species of Leishmania.

"Australasian Medical Gazette," vol. xxxiv, No. 18, November 1, 1913.

Rat Leprosy in North Queensland.—Priestly states that rat leprosy has been shown to be present in the rats in Townsville, North Queensland. The disease presents the same features which have been described as occuring in other parts of the world. Two hundred and twenty rats were examined, and twelve found infected. Six of the rats showed the lymphatic form and six showed the musculocutaneous form of the disease. The percentage of rats presenting the musculocutaneous form is very much greater than has been described in other parts of the world.

Annotation.

Yellow Fever in West Africa.—The *Yellow Fever Bulletin*, vol. iii, No. 1, states that the recent outbreaks of yellow fever in the Gold Coast Colony and in Southern Nigeria have again called attention to conditions in West Africa. Investigations are now being carried out by the Colonial Office, and it is to be hoped that some definite results will be obtained which can be universally accepted, but it must necessarily be an arduous task, and probably a question of years of observation to get to the bottom of the matter. It has been pointed out in the abstract of the West African Fever Report (*Bull.* II, 4, pp. 374-390) that the diagnosis of yellow fever could hardly be accepted in all the cases included in the Report. The Report, however, contained exceedingly interesting material and important evidence of the endemicity of yellow fever in various parts of West Africa. The problem of the way in which intervals of outbreaks of the disease are bridged over remains in *statu quo*. All available evidence points to the occurrence of atypical, probably mild, cases in natives, especially native children, but exact knowledge of the character and frequency of such cases is still lacking. If this problem can be satisfactorily solved, a very great step forward will have been made in our knowledge of yellow fever.

Since the late Sir Rubert Boyce started the discussion on yellow fever in West Africa in 1910 it has never been dropped, and it is natural to hope that the investigations which have been taken up with renewed vigour in the British Colonies will be followed by similar investigations in the French and German possessions. Thus it might perhaps be possible to solve the problem for the whole of West Africa, and to open the way for mutual agreements with regard to anti-yellow fever campaigns to be conducted on uniform lines and with the least possible inconvenience. Anti-mosquito campaigns are being conducted in all the West African possessions with more or less vigour, but no satisfactory arrangements have, however, been obtained with regard to quarantine regulations.

Notes and News.

SMALL-POX IN CHINA.

Small-pox obtains in China the year round. The practice, until very recently, of inoculating all infants with small-pox is giving way to vaccination, especially among the better class of people. Many well-dressed men and women are seen with smooth, perfect skins. Even a coolie is occasionally noted who gives no visible evidence of having had the disease. It is stated that the inoculation operation consists of powdering the scabs of the disease and blowing the product i to the nostrils of the child through a quill. Some state that some irritating substance, such as camphor, is mixed with the infection before it is used. The idea seems to be, that as the disease is so certain to be contracted, perhaps after years, in which event the parents will be put to considerable expense and labour, it will be better to have the child take the disease at once and either die or be rendered immune by having had it. Among the poor, the responsibility of raising a child is a great burden, even though the expense will amount to only a dollar or two gold per year.

The influence of the missionaries, especially medical missions, and a certain leaven of education and enlightenment which is creeping into China, is beginning to give evidence of its existence.

I am told that when the word is passed among the people that the missionary doctors will vaccinate, hundreds will present themselves for the operation. This work is often done by the Chinese "boy," many of whom are connected with the medical work.

In connection with missionary enterprise, when we inquire, we learn that from 5,000 to 25,000 or more people annually receive treatment at these philanthropic institutions, either in hospital or at dispensary, together with instruction which is given in their own tongue in matters relative to health and sanitation, and the great influence for improvement is at once made noteworthy.

The extent of this work in China is surprising. Not only does the medical work have a direct influence, but the missionaries instruct the people in habits of cleanliness and the eradication of filth and disease. Especially, the schools for girls and women's colleges will have the greatest influence for good. Foreign Government schools also assist in the general awakening of slumbering China.

As the foreigners secure more and more freedom in China, and as China awakens to her perils and needs more and more, especially in health matters, so the more do we note the result. It is not uncommon now for Chinese officials, of higher or lower rank, to issue proclamations, instructing the people and exhorting them to do what they can in their own behalf. The time when Chinese rather considered plagues and starvation as an act of Providence, in clearing out many poor people to make room for others, is passing. The late plague in Manchuria and starvation in the Central Provinces is now considered rather an affliction and injury to the progress of the nation.

A crude method of vaccination is also practised, especially among the poor people. A child is vaccinated at many spots, and when the typical vesicles have developed, the pus is used to vaccinate the children in wholesale lots by natives at a most trivial expense. A "boy" at the hospital told the Sister that many native "doctors" used a method of mixing this pus with human milk before use. It is now very common to see Chinese with vaccination marks, usually at any or several places on the body.

These marks are called mo:a marks. A common place is on the legs.

The Chinese make no effort to conceal the disease or prevent its spread or to avoid it, so far as I have been informed. Disinfection and treatment of infected clothing is unknown.

They do not fear the disease, and seem to consider it one of the circumstances incident to an existence. I have been told that a red cloth is used to cover the face of the afflicted infants, but on inquiry I have not heard this report confirmed.

The disease is not very fatal among the people. Mortality rate is very low. This is probably due to a racial immunity, incurred through centuries of exposure.

Very few adult Chinese take the disease. By far the greatest number of cases occur in infants and very young children. The adult people will not quit their usual employment as a rule, unless too ill to drag their limbs about, and the children are given their liberty as they wish. Nevertheless, it is stated that they have made some attempt at treatment which, however, consists in doing nothing. The people are confined in the dark, if such place is available, and their huts usually answer the purpose admirably. Further treatment consists in allowing no cleansing water to touch the body until the scabs have well formed. This results in severe pitting, and a worse sequel is most serious eye disease. A Sister at the mission hospital states that this practice is responsible for much of the blindness. The Chinese as a rule do not favour the use of water for any purpose other than the necessities of life. The foreigners are often referred to as "soap wasters," I am told. A fire hose turned on to a mob in a riot has proven more effective to dispel ambition for ruin than the sight of rifles and pistols. The Chinese at the hospitals are very refractory to treatment as regards disinfecting baths. Not only persuasion, but also force, is required when this part of the treatment is given.

As an example of the indifference of the people to this common disease, the incident of a man presenting himself at the hospital door with a well-developed case, stating that he thought something was the matter with him, is related. He had been going about his work until someone told him that the missionaries would take care of him, which information he wanted to verify for himself. Upon being placed in the isolation ward and given daily baths he remonstrated most decidedly, not considering his state so serious as to warrant such drastic treatment.

Winter and spring furnish the most cases, although the disease is constantly present.

As regards foreigners, by far the most cases occur in new arrivals. The residents learn to practise frequent vaccination, and learn to avoid the most certainly infected regions. As in all diseases in which filth and insanitation play the leading part —and as this condition obtains universally with the poorer classes of natives, and as visiting foreigners will only come in contact with these people—the most favourable conditions for contracting the disease are the result of the entire circumstances. The beggars and native city districts and any native hut may prove a concentrated source of infection. A certain morbid curiosity in some, to examine closely (so as to have something to relate aboard ship or in letters home) all filthy, diseased beggars, presenting ghastly anomalous lesions, is a practice to be condemned and discouraged by all possible means. It seems reasonable to suppose that actual cases of small-pox patients having been exposed to the credulous sympathy and liberality of incautious foreigners have occurred. Some will consider such cases leprous or syphilitic, but experience teaches to shun such unfortunates like the plague, for they are equally dangerous. If philanthropy insists on being satisfied, the range and skill of the baseball accomplishment should be brought into requisition in bestowing the alms.

Foreign missionary workers are often smitten, especially those engaged in school work for children. I know of two Catholic priests having taken the disease at the same time at the same school.

At present more and more missionary work among the natives is being done by native preachers and teachers, who have been trained at schools in the large ports by the missionaries, so it occurs that the disease is not now so much encountered as formerly. However, many of the long resident foreign missionaries and other foreigners have taken the disease, while others more fortunate are likely less susceptible to the illness. More than that, after short residence in China the attraction of visiting Chinese filth and degradation gives way to disgust and a desire to avoid many places and conditions.

In the port cities the "washaman" business has offered vent to Chinese industry and avarice, and the business in many instances has been developed to a perfect sanitary status, using modern steam methods. In former days, and also at the present time in the small outlying towns, no washmen being available, such work was done by families with water drawn from the river. The danger of contraction of the disease from infection in washed clothing from infected huts, handled by infected hands, was most positive.

The practice of some foreigners of housing their servants in their own compounds, and giving their quarters close attention, together with instruction in this matter, is an experiment which has proven satisfactory in reducing incidence of the disease among foreigners.

The conditions, as they exist in China at present, are well represented in the following paragraph, extracted from an article on "The Prevention of Infectious Disease in the Yangtse Valley," by the writer, as follows: "So, in a country like China, where the natives understand so little of the nature of infectious disease, especially its method of extension, and care less, and actually are antagonistic to efforts put forth to discover disease among them and prevent its spread, special danger exists. Moreover, by centuries of contact they have developed a degree of tolerance which foreigners do not possess.

and because of this may carry disease about with impunity. Also, their habits and customs, their living together in most crowded and insanitary conditions; their communication with each other over large districts, because of industrial pursuits, which will carry the men all over the city and into all places, going and coming to and from work, would seem to make all or any intercourse with the natives dangerous."

The instinct of economy in Chinese leads them to patronize the Chinese rickshaws with the iron tyres, in preference to the pneumatic tyred vehicle. In view of this fact, it is advised that all foreigners employ rather the pneumatic tyred rickshaws.

Thorough bathing daily and immediate washing of the hands after coming in from the streets should be practised.

While the disease is worse during the winter months, the state of the temperature will cause all to remain indoors when possible to do so. In the summer time, when people naturally spend more time on the streets and in the open air, danger of contact would seem more likely. However, the greatest danger occurs during the spring months, when the people break out from the winter huts to enjoy the sunshine after a period of disease and confinement. At such time, especially, the most strict precautions should be practised.

Furs and clothing from native shops should be disinfected before use. The material and place of workmanship can very possibly be infected.

All Chinese rags should be avoided. Chinese women, sewing in a pile of rags, are often encountered on the streets frequented by foreigners, even in cities as large as Shanghai. Avoid most carefully such places. The rags are almost certainly infected. Women who solicit jobs of sewing from house to house should be driven away, as they may also carry disease and usually belong to this class.

Finally, a danger constantly present is the sampan (row boat) with a family living aboard. As certain as children are born, so certain are the poorer ones of being given the small-pox. An infant in a sampan means certainly a case of small-pox aboard during the year. Infants and children just able to walk or older are often seen with their faces covered with recent pigmented scars. This means recent small-pox aboard, and as the infective agent has great vitality, and as conditions for its life and propagation are especially favourable on a sampan, the danger is at once seen to be positive.

If one wishes to use a boat one should be used which has no family aboard and one only patronized by foreigners, if possible. The Sisters of a mission at Hankow told me that when they wished to cross the river to Wuchang, they used only the sampans as described above, and as an additional precaution had the boats washed before the trip was made.

J. F. RUPERT, U.S. Navy,
U.S. Naval Hospital, Annapolis, Md.

Written in China,
June 26, 1911.

THE third quarterly number of the *Bulletin of the Imperial Institute*, vol. xi (1913), No. 3, published in the beginning of October by Mr. Murray, contains, among the reports of recent investigations, the results of examination in the laboratories of the institute of a large number of samples of cotton from Uganda, of new Colonial and other tanning materials, and of essential oils from various Colonies. Among the special articles is one of exceptional interest and value by Dr. Walter Busse, of the German Imperial Colonial Office, who outlines the organization of experimental work in agriculture in the German colonies, with special reference to tropical possessions in Africa. An article on the coal resources of Canada, based on official sources of information, gives a comprehensive survey of the subject (together with a bibliography) which will be new to most readers, in so far as the large output in British Columbia and Alberta is concerned, as compared with that of Nova Scotia. The increasing demand for wood oils should direct attention to an illustrated article by Mr. Ernest H. Wilson, the well-known traveller and collector, on Chinese wood oils, the production of which in various parts of the British Empire is strongly recommended.

The *Bulletin* concludes with some general notes and reports of recent progress in agriculture and the development of natural resources, together with notices of recent literature.

Drugs and Appliances.

FUMIGATING AND DISINFECTING APPLIANCES.

As usual, the Clayton Fire Extinguishing and Ventilating Co., Ltd., has been busy throughout the past year equipping vessels with their fire-extinguishing and disinfecting machines. The Company, moreover, has supplied machines for disinfecting and fumigating purposes to all parts of the world, including several of their largest types of machines for Kilindini, Mauritius, Fiji, Lagos, Singapore, and Uganda, to the order of the Crown Agents for the Colonies, in addition to machines for Foreign Governments.

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2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

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Original Communications.

THE USE OF THE TUNING-FORK IN DIAGNOSING THE OUTLINES OF SOLID AND HOLLOW VISCERA OF THE CHEST AND ABDOMEN AND OF CERTAIN PATHOLOGICAL CONDITIONS.

By James Cantlie, M.B., F.R.C.S.

(*Being an account of a demonstration at the London School of Tropical Medicine to members of the International Medical Congress, August*, 1913.)

For some years I have used the tuning-fork in conjunction with the stethoscope as a means of ascertaining the exact outlines of the liver and other organs. My desire, in the first instance, was to ascertain more accurately than is possible by palpation and percussion the area occupied by the liver and spleen, as these are the chief solid organs affected by tropical diseases; but I found that the hollow viscera—the stomach and the cæcum—lent

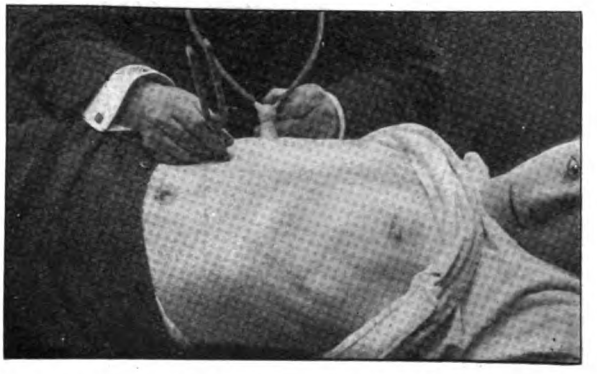


Fig. 1.—Examining liver in front of axillary line, standing on right side of patient.

themselves to the tuning-fork-stethoscope method of ascertaining their dimensions. Further, I extended the same method to the organs of the chest, and found that by its means several conditions are more readily and precisely ascertainable than by the means of diagnosis in use heretofore. To gauge the exact area occupied by the liver, for instance, by percussion alone can never be more than approximately accurate; whilst, at times, it is difficult and occasionally impossible, owing to pain, distension, &c., to define its outline with any degree of precision likely to prove useful for clinical purposes. Palpation is applicable to the lowest strip of the liver only, and even in healthy states it is more a matter of opinion than an actual clinical fact where the lower border of the liver lies; when, on the other hand, the liver is tender or the abdomen tense from distension or there is ascitic fluid present, the lower limit of the liver is still more obscure. By the tuning-fork-stethoscope the limits of the liver can be gauged with almost hair-breadth precision.

The principle involved in the use of the tuning-fork-stethoscope method is that when the stethoscope is placed over an organ, be it a solid organ such as the liver, spleen, heart, &c., or a hollow organ such as the stomach or cæcum, and the vibrating tuning-fork is made to impinge on the surface of the body over one or other of these organs, the note of the tuning-fork manifests by its loudness the limits of the organ being examined, and the moment the limits are passed the note becomes faint, distant, or is altogether inaudible.

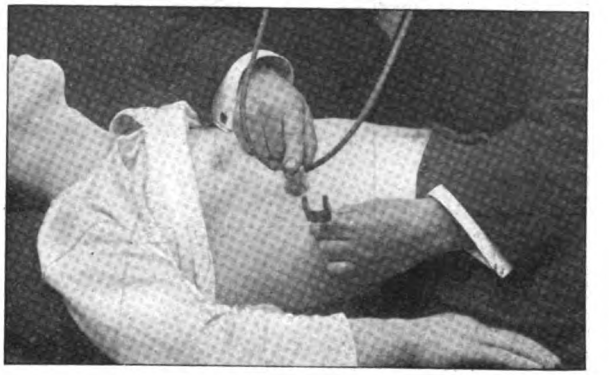


Fig. 2.—Examining liver in axillary line, standing on left side of patient.

The Tuning-fork.—I have tried many forms and kinds of tuning-forks; some with high-pitched, some with low-pitched notes; some forks with flattened or button-shaped, and some with pointed ends. The best results are obtained by a fork made for the writer by Messrs. Mayer and Meltzer, 75, Great

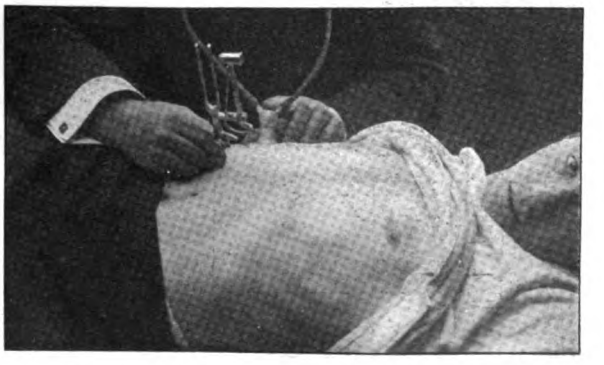


Fig. 3.—A tuning-fork with hammer attached.

Portland Street, London, W. The note is G-sharp, and the end of the fork is not flattened, but pointed rather. The fork may be struck against anything hard, the heel of the boot if nothing else is available, and whilst loudly vibrating the end of the stem is pressed lightly but firmly upon the skin.

In fig. 3 a tuning-fork with an arrangement whereby the fork is made to vibrate by an attached hammer is portrayed. It is a convenient but not

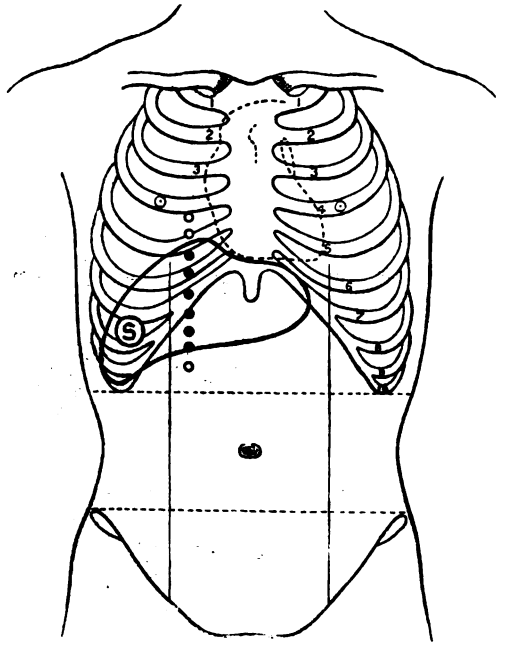


FIG. 4.—Liver, vertical dimensions. S, stethoscope; ●, tuning-fork loudly heard; O, tuning-fork on lung and gastro-intestinal tract faintly heard.

at all a necessary arrangement, as the ordinary fork is easily set vibrating by striking anything convenient. The sounds heard when the stethoscope is

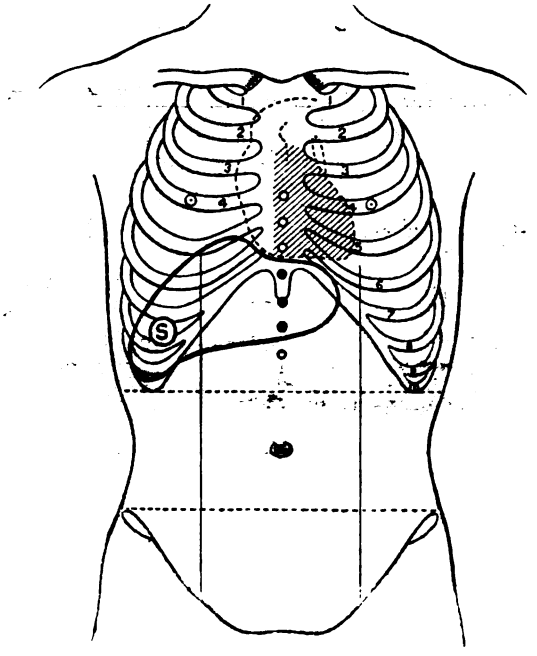


FIG. 5.—S, stethoscope applied. ●, loud notes over liver; O, faint sounds over heart and stomach.

placed on the skin over any of the organs mentioned seem to proceed from the point where the fork impinges on the skin, but when the fork passes from off the organ over which the stethoscope is placed the sound is not only fainter, but it seems to proceed from the free or distal end of the fork, and not from the point where it touches the skin. By a little practice this peculiarity becomes more evident and is a useful adjunct to the mere loudness or faintness of the sound in the matter of diagnosis.

The practical application of the tuning-fork-stethoscope method, applied, say, to the liver, is as follows: Place the stethoscope (binaural) on the lower part of the chest wall just above the lower part of the right true rib cartilages about one inch

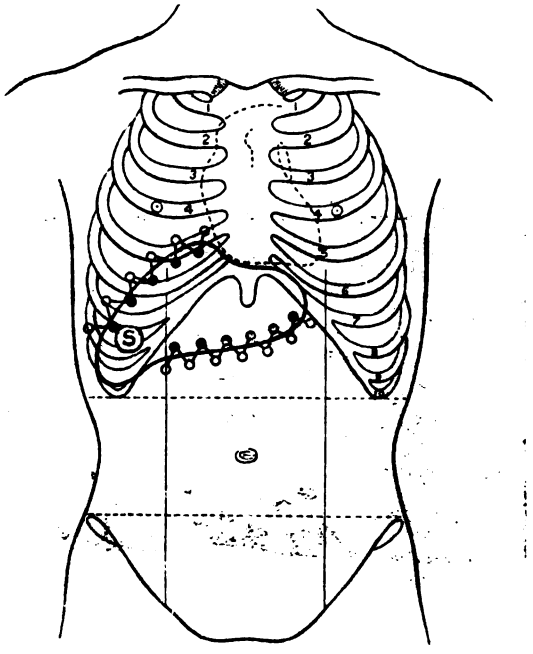


FIG. 6.—Tuning-fork track along outlines of liver. S, stethoscope; ●, loud sounds of tuning-fork over liver; O, faint sounds beyond outlines.

behind a line drawn downwards from the right nipple (see S, figs. 4, 5, &c.). The tuning-fork is now made to travel from the region of the chest midway between the sternum and the nipple line (fig. 4) downwards over the liver. The note heard (if heard at all) when the tuning-fork is over the lung is faint or distant, but the moment it reaches the area of the liver the note is loudly heard; when the lower limit of the liver is reached and the tuning-fork has other abdominal organs beneath it, the sound suddenly fades away to a faintly distant hum. The degree of pressure necessary for diagnostic purposes varies; over the chest the end of the fork has only to be gently pressed against the skin; but when a careful search has to be made for the limits of the lower edge of the liver, as in stout people or in cases of distensions from gas in the intestines or fluid in the peritoneal cavity, the fork has to be

pressed fairly deeply at times, so that the piece of intestine may be pushed aside or the fluid between the abdominal wall and the liver displaced.

Fig. 5 shows the application of the tuning-fork over the heart, liver, and stomach, and it is at once evident from the diagram that along the middle line of the body the loud sounds are over the liver, and the faint sounds are over the heart above and the stomach below.

Fig. 6.—The upper and lower limits of the liver may be quickly and accurately ascertained by rapidly passing the tuning-fork all around its presumed borders, when any divergence from the regular outline is at once perceptible, and any discrepancy between the relative sizes of the two sides of the liver at once brought to light.

At times it is well-nigh impossible by palpation or percussion to know where the liver ends on the left if the spleen happens to be enlarged as well, and *vice versa*, for the two organs may be actually

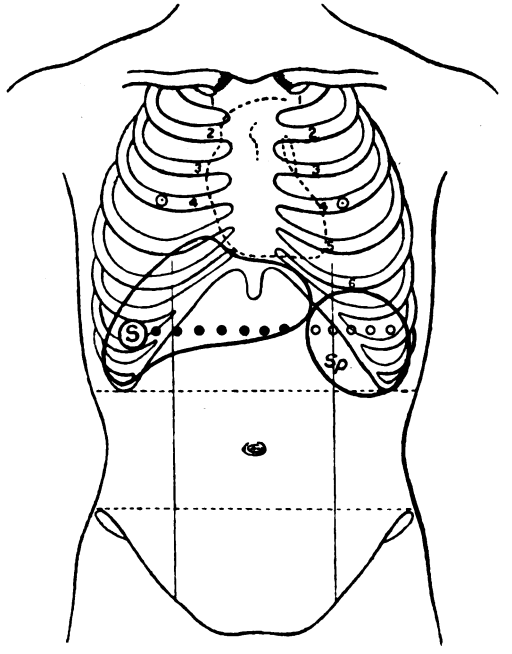


FIG. 7.—When liver and spleen touch. S, stethoscope over liver distinguishes ●, loud sounds over liver, and O, faint sounds over spleen.

in contact. The tuning-fork-stethoscope method at once settles this point, for if the stethoscope is over the liver the sounds may be wholly inaudible when the spleen is beneath the tuning-fork. Similarly, when the stethoscope is over an enlarged spleen the tuning-fork, when superimposed on the liver, is inaudible or faintly heard (fig. 7).

An effusion into the pleura is at once detected by the tuning-fork (fig. 8). As the diagram explains, the tuning-fork is heard only over the liver when the stethoscope is superimposed over that organ, and only faintly heard or is wholly inaudible over the lung, the effusion, and the abdominal contents below the liver. This is of great clinical assistance, for neither by percussion, palpation, nor by auscultation can it be positively diagnosed whether the dulness or absence of breath sounds is

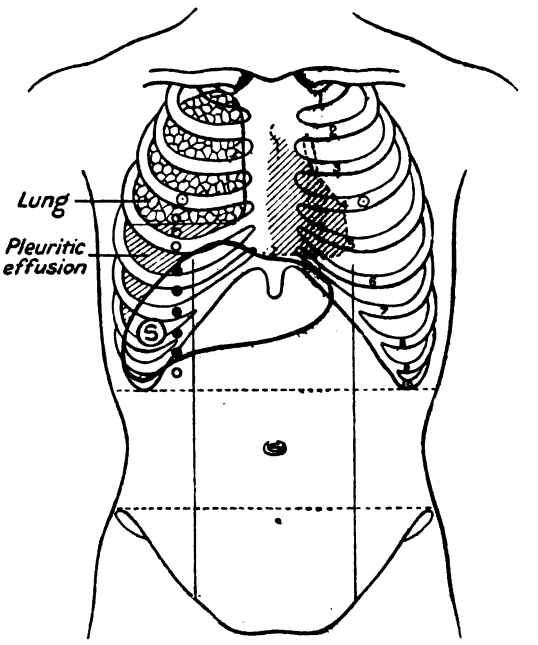
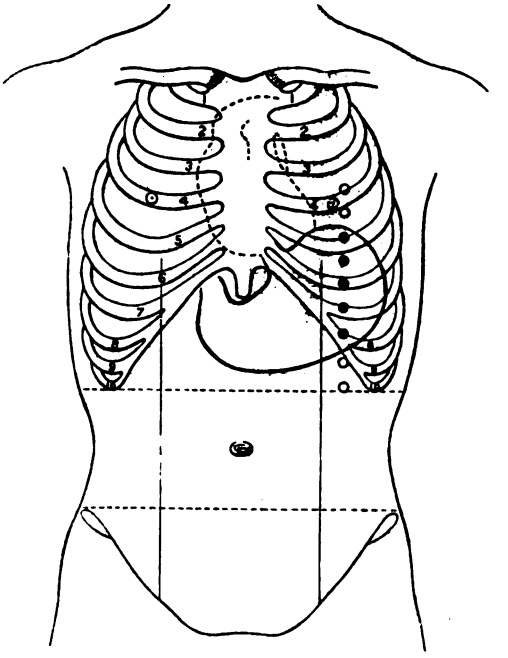


FIG. 8.—Effusion into pleura. S, stethoscope; ●, loud sounds; O, faint sounds.

due to pleuritic effusion, to an abscess of the liver, or to a liver pushed upwards towards the lung by abdominal distension, &c.



IG. 9.—With stethoscope placed anywhere over stomach. ●, loud sounds heard; O, faint sounds heard.

Passing now from the solid viscera to a hollow viscus, the stomach, as in fig. 9; here, again, it will be found that the tuning-fork answers true. The dimensions of the stomach are definable with precision, and the writer has tested the accuracy of the method in question compared with that of the X-ray screen or photographs. The dimensions of the cæcum can also be accurately told, and the difficulty at times found to be certain whether the full and movable cæcum or colon is not really a movable or dropped right kidney is at once settled. The track of the large bowel can also be followed for some distance, for when the stethoscope is placed upon the cæcum, the vibrating tuning-fork can be heard as it is carried along the ascending colon and across the body along the transverse colon as far, at least, as the middle line. In several varied abdominal conditions the tuning-fork method of diagnosis may be of service, and has proved so in the writer's hands. The dimensions of a pregnant uterus, of an ovarian cyst, or a uterine fibroid can be gauged by the tuning-fork-stethoscope method. A distended gall-bladder felt as a tumour through the abdominal wall can be isolated by sound from the liver, or other adjacent organs.

In Fractured Bones.—When a thigh bone or any of the large bones of the limbs are fractured anywhere along the shaft, the stethoscope placed over one end—say, over the great trochanter of the fractured femur—the vibrating tuning-fork, placed on the lower end of the bone just above the knee, cannot be heard so well as on the sound side.

In the case of a fractured rib, when the stethoscope is placed far back on the shaft and the tuning-fork far forward, it is easy to detect the difference of the note in the fractured rib or ribs, from that over the sound ribs above and below. A doubtful fracture of the sternum, collar-bone, &c., can be detected in the same way.

The Heart.—The dimensions of the heart are readily and precisely ascertainable by the tuning-fork-stethoscope method.

The method here described has many other possible forms of application. I have been making observations on the different tones which are specific to different affections of the liver; that a fatty liver gives out tones distinct from a cirrhosed liver there is no doubt, and so with other ailments; but as yet sufficient evidence has not been collected to tabulate the sounds peculiar to each.

N.B.—In applying the tuning-fork it is better not to drag it along the skin, but to raise it and "dab" it on the skin at short intervals.

As the upper limit of an organ is made out, the forefinger of the hand adjusting the stethoscope can be kept at the spot where the notes pass from loud to faint until the spot is marked by a pencil, and the same can be done when the lower limit of the organ is reached.

"ESPASMO TROPICAL": A PECULIAR DISEASE OF GREAT MALIGNANCY, ASSOCIATED WITH A PARASITE IN THE BLOOD.

By R. Vergne, M.D.

Health Officer, Barceloneta, Porto Rico.

For years this disease has been known to exist in Porto Rico, but it has never been investigated. Since the brilliant studies of Major Bailey K. Ashford on uncinariasis, however, the medical profession of Porto Rico is awakening to the fact that proper and well carried out investigations will show that we have here many unknown tropical diseases.

"Espasmo tropical" is the name given to a disease which appears under two different forms. We shall first describe the one form, which may be benign or malignant in character, according to the symptoms.

Form "A."

(1) *Benign Form.*

There is apparently no period of incubation. The person attacked has previously been feeling quite well, when suddenly he notices that he cannot open his mouth. In other words, he has trismus. Shortly after he loses consciousness, at the same time the temperature rising to 40° C. After a period of from eight to fourteen hours, under a stimulating treatment the patient comes out of the profound stupor and recovers. This takes place in the majority of cases.

(2) *Malignant Form.*

In this form we have, in addition to the trismus, a deep cerebral invasion from the beginning. There is a marked typhoid state. The patient is very restless and at times there is a low muttering delirium. The temperature is high, and may reach 41·5° C. Vomiting of a dark greenish material is very common. The pulse is weak and rapid. The attack lasts for two or three days, when death supervenes in almost all the cases. The difference between the two forms lies in the cerebral symptoms. In the benign form there is loss of consciousness, but the patient is very quiet, as in a condition of catalepsy. The sense of pain is abolished, reflexes are absent. In the malignant form there is the marked typhoid state, the reflexes are increased, the patient is very restless, and the sense of pain is preserved. In both cases there is constipation.

Form "B." Typhus-like Form.

This is always malignant. It is characterized by a very short period of malaise, during which time the patient goes about as usual. Suddenly he vomits, falls to the ground and becomes unconscious. In these cases the temperature remains stationary at 37° C. during the first seven or eight hours. Then it goes up to 40° C. and 41° C. The period of almost complete unconsciousness lasts for three or four days, to be followed by one of great cerebral irritability, which later is accompanied by convulsions of extreme violence. Then it develops into a state

of relative tranquillity, if it does not terminate by death. Those who survive become insane during a period of from two to three weeks, after which they completely recover if properly treated. In addition to the above symptoms, there is a spasm of the muscles of mastication and deglutition, obstinate constipation, dilatation of the pupil and weak and rapid pulse.

In the majority of cases there is no prodromal period. The patient is seized by a very high fever and soon passes into a state of profound stupor accompanied by a low muttering delirium. The facies are very characteristic, the patient's appearance assuming a dull, agonized expression. The pupil is contracted but expressionless. The mouth twitches, and the whole face is haggard.

There is no vomiting at any stage of the disease. There are no convulsions. There is obstinate constipation.

There are two cardinal symptoms which at a glance disclose the very malignant character of this type of the disease.

The Tongue.—This is pathognomonic. From the beginning the tongue is very dry. From the third day it takes on its characteristic appearance. I shall describe it with just one word. The tongue is that of a mummy. It is only a charred piece of flesh.

The Eruption.—This is also pathognomonic. Right from the start of the disease there appears an eruption, which in the majority of cases is localized in the abdominal region. It begins by very small, dark spots with raised edges, and which do not disappear on pressure. They remain thus until the third day, when they turn to a red colour and become somewhat umbilicated. By the fifth or sixth day they change to a bluish colour which is permanent to the end of the disease.

Other Symptoms.—Throughout the whole course of the disease there is scanty, dark-coloured urine. At times there is complete suppression of urine. Near the end, just before death, the patient sweats and urinates profusely, recovers his power of speech, his eyes take an intelligent look, and then he dies.

The Temperature.—From the first day the temperature rises up to 40·5° C. and 41° C., and remains so until the fifth day, when there is a morning drop to 36·5° C. But very soon it rises again to 40·5° C., and remains stationary during seven or eight days. In those very rare cases who recover the temperature begins to drop gradually by the tenth to the fifteenth day.

The Pulse.—From the beginning there is a very weak and rapid action of the heart, which is not markedly improved by the injection of the various heart stimulants. There is an intense weakening of the heart muscle. The pulse varies from 125 to 140.

Respiration.—The respirations are very little increased.

Abdominal Organs.—The spleen is invariably enlarged and hard to the touch. The liver is congested. The intestines are normal. In regard to the alimentary tract and in connection with its functions, the patient shows a great aversion to taking food or medicines. He will take a few mouthfuls, retaining them inside the mouth for a few minutes and then spitting them out.

Complications.—The usual complication is bronchopneumonia. Its symptoms appear by the fifth day. Acute endocarditis is the actual cause of death.

Findings in the Blood.—In twelve cases suffering from this disease the blood has shown what appears to be a parasite. This is a little oval body, which is mainly extracellular, measuring from 2 to 3 microns. It may occur, however, within the red cells, situated, when single, near the periphery of the cell. When multiple it is situated in the very centre of the corpuscle, arranged in a sort of mosaic work. They are very small, and difficult to detect. Stained with Wright's stain they are seen to consist of a nucleus situated towards the pointed extremity and which takes on the acid dyes; the protoplasm, which is abundant, stains blue. These bodies are not numerous, and the specimen has to be searched for very carefully in order to find them. When extracellular, they are seen in clusters.

In the fresh blood they are seen to possess an amœboid movement. When in clusters they appear to form an elongated mass which after a short while, by a to-and-fro movement, becomes spherical.

There is no leucocytosis. One of the striking features of the blood is the great differential increase of the large mononuclears. The polymorphonuclears present belong to the neutrophilic variety.

Autopsy.—In a case of three days' duration a *post-mortem* disclosed the following pathological changes: *Spleen.*—The spleen was greatly enlarged, of a hard consistence, and of a brown mottled colour. Stained specimens showed a large number of bodies, like those seen in the blood; what appeared to be flagellated bodies were also seen. *Liver.*—The liver was a little enlarged, of a dark red colour and extremely friable. Stained specimens showed a few bodies. *Intestines.*—These were normal. No ulcerations. *Heart.*—The organ was very full of blood. There were signs of endocarditis. *Lungs.*—These were congested; normal colour. *Brain.*—Not examined. *Glandular system.*—A general enlargement of the glands was present.

Treatment.

The treatment of espasmo is purely symptomatic. Hypodermic injections of strychnine, or caffeine and camphorated oil may be given to stimulate the heart. Physiological salt solution may be injected into the veins. Hypodermic injections of quinine give no results.

Mode of Transmission.

The disease may possibly be conveyed to man by insects. The fact that near a place where five cases have occurred there were several breeding places of anopheles, makes it just probable that a mosquito belonging to this family might be the transmitter of the disease.

THE DETECTION OF TRYPANOSOMES IN ANIMALS.

By ALEXANDER LUNDIE, M.B.

Gold Coast, West Africa.

THE detection of trypanosomes in animals is often a matter of difficulty, but in cases where plenty of blood can be obtained I have found the following method yield very good results.

When an animal is to be slaughtered for food, or when one of the big game has been shot, blood is allowed to pour directly from the cut throat into a test tube containing 5 gr. of potassium citrate, dissolved in 5 c.c. of sterile water. The tube, of course, and its plug have been carefully sterilized beforehand. When three-quarters full the tube is plugged, and the contents are mixed by rolling. The preparation is then set aside till time can be found to examine it. Within half an hour there is always a little clear fluid on the top of the blood, and if there are any trypanosomes at all in the blood they will certainly be found there, seeming to be more abundant on the surface than lower down. They are, moreover, much more easily detected in the clear fluid, and films made with it allow of the preparation of magnificent specimens when stained by Giemsa's method. Of course, one never stains the specimen until the living trypanosomes have been detected, so a great deal of time is saved by this method, and it yields a larger number of positive results than any other that I know of.

Another advantage of this method is this, that it can be used for the study of the development of trypanosomes. The preparation is simply left alone till all the red corpuscles have settled down, which takes about three days, or the top layer can be siphoned off into another sterilized tube, and set aside for study. Latterly I have been in the habit of taking a quantity of twenty ounces of blood at a time, and making several culture tubes from it in this way, and I have easily got crithidial forms thus. It seems, in fact, far more rational than attempting to develop the parasites in the water of condensation of a culture tube, as it is scarcely credible that such drops of condensation are anything very different from distilled water.

To study the life-history of trypanosomes in tsetse flies, one can imitate the chemical change in the fly's stomach fairly well by mixing the fresh blood, with a sufficient volume of hydrochloric acid, diluted so as to contain 0·02 per cent. by weight of hydrochloric acid. When the requisite proportion is added, the blood at once becomes brown in colour, and sets into a jelly, which exactly resembles the congealed blood that can be squeezed out of a fly that has drunk blood. The addition of a digestive ferment to the mixture would no doubt complete the culture medium quite successfully. The matter of temperature is simple, as the fly cannot possibly incubate its ingested blood at a temperature much higher than that of the air. Experiments in this direction promise a certain amount of success, and are certainly different from what have hitherto been in vogue.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 15, 1914.

PELLAGRA INVESTIGATIONS.

DR. L. W. SAMBON, after a sojourn in the United States of America, in the West Indian Islands, and in British Guiana, returned to London on January 6, 1914. This is the third expedition made by Dr. Sambon in order to investigate the etiology of pellagra. The first field of his study was in Italy and the Tyrol, the second comprehended practically the whole of the South of Europe from the Black Sea to the Atlantic, and the third—now just accomplished—has been devoted chiefly to the central area of the Western Hemisphere.

It will be remembered that the original reason for these expeditions was the doubt thrown upon the accepted cause of pellagra, namely, eating of diseased maize, by Dr. Sambon. So well did he put his case that a few believers in the necessity for his opinion being investigated formed themselves into a committee, entitled The Pellagra Investigation Committee, and after collecting funds chiefly through the columns of the *Times* and by the liberal help of the Colonial Office, sent Dr. Sambon to Italy to inquire more fully into the etiology of this obscure ailment. The report of this expedition brought a new idea to scientific men in countries more especially where pellagra was known to prevail, and led to much discussion on the subject. Meantime,

the subject of pellagra was attracting a great amount of attention in the United States, for it was found that the disease was attaining a widespread hold upon many of the States in the Union.

Dr. Sambon, whilst doubting the part played by maize in the production of the disease, formulated his belief in the etiology and brought forward the suggestion, amounting on his part to almost a settled conviction, that pellagra was an infectious disease, and that it was conveyed by a biting fly. He inculpated the *Simulium*, a fly popularly termed a sandfly, but really scientifically distinct from that group of insects; and wherever Dr. Sambon went in Europe he found that pellagra was associated with the presence of *Simulium*.

In 1913 a still further and most interesting factor came into prominence. It was no other than that pellagra was discovered to be fairly widely spread within the British Isles. This fact, now well established, had long been suspected by Dr. Sambon, although he had no clinical proof that such was the case. It was, however, by his description of pellagra in the medical journals of this country that the disease was unearthed, and it has now been incontestably proved that in England, Scotland, and Wales cases of pellagra are met with in our lunatic asylums and elsewhere.

The growing importance of the subject led to yet a third expedition to the West Indies, where, under the auspices of the Colonial Office, the Pellagra Investigation Committee, and by the liberal assistance of Mr. H. S. Wellcome, he was enabled to proceed to the West Indies in August, 1913.

When it was known that Dr. Sambon was proceeding to the Western Hemisphere, the Pellagra Commission in the United States invited him to visit them and to exchange views on the subject of the disease. A cordial reception awaited him, and in Spartanburg, Columbia, and Charleston he delivered addresses to the medical societies in those cities. Captain Siler, of the United States Army, the chief of the American Pellagra Commission, who had previously travelled with Dr. Sambon in his pellagra expeditions in Europe, again joined him in part of his journeys, and he was accompanied also by Mr. Jennings, of the Entomological Bureau, Washington, U.S., and by these scientists every help and assistance was given.

In the United States Dr. Sambon found the authorities keenly alive to the presence of pellagra in their midst, and anxious to confer with him upon the subject of the etiology of the disease. His theory of the causation of pellagra was favourably entertained by men of distinction, and all were ready to listen to his explanations.

Dr. Sambon was especially struck by the excellent work being done by the Thompson-MacFadden Pellagra Commission in South Carolina. After leaving the United States, Dr. Sambon visited the Panama Canal Zone at the invitation of Colonel Gorgas, and was astonished at the sanitary and preventive work which had been done there, whereby the work of the Canal had been made possible. On reaching the West Indian Islands he visited Jamaica, Barbados, Trinidad, Grenada, and St. Vincent, and proceeded thence to British Guiana. It is well known that pellagra is present in these regions, and of this fact Dr. Sambon had convincing proof.

With an activity and enthusiasm peculiar to himself, Dr. Sambon devoted attention to many other matters of medical interest besides pellagra, and he has returned with a wealth of material in the way of notes on such subjects as blackwater fever, filariasis, leprosy, &c., and with photographs numbering well over a thousand. Dr. Sambon was accompanied by the artist, Mr. E. Schwartz, who worked with him throughout the trip, and we look forward with interest to the published report in the near future.

Dr. Sambon cannot speak too highly of the courtesy and kindness he received wherever he went, and of the facilities granted him by the Government authorities, by the medical men he met, and by the veterinary departments in the several Colonies he visited.

Annotations.

Plague in Manchuria.—In a very interesting report concerning the North Manchurian Plague Prevention Service, published in the *Journal of Hygiene*, October, 1913, Wu Lien-Teh (G. L. Tuck) reaches the following conclusions:—

(1) That even though the tarbagan occasionally suffers from plague the epizootic is never extensive, and the animal does not play nearly so important a *rôle* in the spread of plague as does the rat. Indeed, its direct relationship to human plague may be considered as negligible. Moreover, the mode of living and habits of the tarbagan are very different from those of the rat; for example, while the rat is a more or less domestic creature in close contact with man, the tarbagan is the reverse.

(2) That from the writings of Russian authorities it appears that plague has existed for many years in various parts of Siberia, sometimes in the bubonic form, sometimes in the pneumonic form. These places may be looked upon as endemic foci. In 1910 it is believed that pneumonic plague appeared in the Russian Ural District long before it made its appearance at Manchouli, and developed into the great Manchurian epidemic. During the latter half of 1911 this form of plague was present in the Kirghiz settlements. In these districts from October, 1911, to February, 1912, over 200 cases of plague occurred. No case of plague, in man or animal, has occurred in Manchuria since the epidemic of 1911.

(3) That from this report it is obvious that statements of the occurrence of plague among men or animals should be believed only when they come from responsible sources—that is, after proper medical and scientific investigations.

As regards the tarbagan the author makes the following statement, that the only definite proof

that tarbagans in nature are affected with plague is obtained from the animal caught by Issaief in June, at Scharasone, and examined by Zabolotny.

To conclude that a man whose occupation is that of a tarbagan hunter, and who takes plague, has been infected from a tarbagan, is comparable to concluding that a man who sells rice and who develops plague has been infected from the rice. In the latter case it is possible that the rice through the rat flea was the source of infection; but if, without some proof that this were so, the statement was made, such a conclusion would be at once condemned as unjustifiable. From the above it seems a pity to the author that responsible authorities and medical men should be so obsessed with the unestablished idea of the great infectivity of the tarbagan as to place hindrance in the way of transporting by rail live, healthy tarbagans for important scientific research at the headquarters laboratory at Harbin, an experience which actually occurred in March of this year.

Salvarsan in the Treatment of Yaws.—Cockin, of Grenada, West Indies, writing in the *Lancet* (December 6, 1913), gives the results of a series of forty-five cases of yaws treated by intramuscular injections of salvarsan. The method of preparing the salvarsan for injection was in all the cases a slight modification of that suggested by Taege, and is as follows. The salvarsan was received from the ampoule containing it into a sterilized and dry test-tube, and there emulsified by the addition of 10 to 12 minims of pure glycerine. Sufficient hot, chemically pure, sodium chloride solution (0·5 per cent.) was added to make the bulk up to 10 c.c. and get the salvarsan into solution. The solution was then received into a sterilized all-glass syringe and so injected. The syringe and needle were sterilized by boiling for each injection, and the skin at the site of injection was painted with a 10 per cent. solution of tincture of iodine.

The point chosen for injection was in all cases that at the junction of the middle and upper thirds of a line drawn from the tuber ischii to the anterior superior iliac spine. After injection the puncture was at once sealed with collodion. The patients were kept in their beds for three days subsequent to the injection, and a four-hourly record of the temperature was made during this period and until the end of the week. A milk diet was given for two days following the injection, after which a full or half diet was allowed. The results of the treatment are shown in a table.

The inference that preliminary treatment with mercury and iodides expedites the action of the salvarsan is not supported by observations made upon cases where these drugs were administered for long periods in the treatment of syphilis, and where salvarsan was subsequently given. The average duration of stay in hospital after injection was 23·6 days, as compared with an average stay of 3½ to 4 months of the patients not injected. Owing to the difficulty in returning children to their parents the average duration of stay is longer than it otherwise would be, and in this connection, with one exception, every case remaining in the hospital for longer than thirty days after injection was under 12 years of age.

From an administrative point of view the advantages of this form of treatment are obvious, since, in comparison with a similar number of non-injected cases, the saving effected in dietary alone, after deducting the cost of the drug used in the author's series, was £75. Still more important, the possibility of completely eradicating the disease from those places in which it exists appears nearer attainment than ever before. This, however, involves the proper segregation of all infective cases, the compulsory notification of the disease, an efficient medical examination of school children, and the refusal to admit cases of yaws into the ports of entry other than through the Yaws Hospital. These measures, Cockin believes, in conjunction with the salvarsan treatment, would aid materially in completely eradicating the disease from any community, and the time occupied in completing the process would depend upon the size of the country and the efficiency with which the measures suggested were enforced.

Entericoid Fever.—Riesman, writing in the *Journal of the American Medical Association* (vol. lxi, No. 25, December 20, 1913), calls attention to certain fevers which simulate both typhoid and paratyphoid fever, but which apparently are different. He proposes that the term "entericoid fever" should be applied to these.

His conclusions, which give a summary of his paper, are as follows:—

(1) The term "typhoid fever," as commonly used by physicians, includes more than one variety of disease.

(2) Only that in which the characteristic serologic and cultural tests for the typhoid bacillus are obtained should be called typhoid fever.

(3) To the others, which clinically may resemble typhoid very closely, the term "entericoid fever" may be applied.

(4) The entericoid fevers are due to different strains of organisms of the paratyphoid group and to others morphologically similar (Gärtner's *Bacillus enteritidis*, &c.).

(5) The source of infection is chiefly food derived from unhealthy animals.

(6) Food (including drink) may become contaminated through contact with diseased meat, through rodents, birds, or through the discharges of carriers, &c.

(7) So-called second attacks of typhoid fever are probably entericoid (paratyphoid) fever, provided, of course, the first was genuine typhoid fever.

(8) In all cases of typhoid-like character careful search should be made for the source of infection, and blood-cultures and other tests for the determination of the infecting agent.

(9) By combined clinical and laboratory investi-

gations it should eventually be possible to distinguish, according to their specific etiology, the various entericoid diseases now grouped together.

Ship-borne Cholera.—Craster (*Journal of the American Medical Association*, vol. lxi, December 20, 1913) writes on "the sea as a factor in the transmission of Asiatic cholera."

He states that during June, July, and August, 1911, ten cholera-infected ships arrived at quarantine, New York, from Mediterranean ports, bringing a total of 5,411 passengers and 1,789 members of ship's crews having been exposed to cholera. Six patients arrived sick, and four were convalescent from the disease. Twenty-four cases were treated at the isolation hospital on Swinburne Island, with thirteen deaths. Two cases occurred among released passengers in New York City and State, and one member of a ship's crew. One fatal case occurred among the quarantine employees. Thirty-one cholera carriers were detected by routine examinations; these were isolated and treated as cholera patients. Four of these gave definite histories of a recent sickness with diarrhœa. During the four months of routine examination of passengers from infected ports for cholera carriers, 26,678 persons were bacteriologically examined.

Over one hundred non-cholera vibrios were isolated during the routine examination. Many of these resembled the vibrio of cholera so closely that no difference was perceptible, except the negative reaction with the specific serum. In cholera, cases of fluctuating rectal temperature of a degree above or below normal persisted for some days after all clinical symptoms had subsided, and after the specific organism had ceased to be demonstrated in the stools. The cholera carriers with no subjective symptoms could be infective up to fifty-four days. The cholera cases remained infective by the presence of the comma bacillus in the stools for one to two weeks after all symptoms had abated, exceptionally for longer periods.

Time and length of voyage from infected districts does not confer any special immunity against the occurrence of Asiatic cholera in this country. The well-established existence of the cholera bacillus carrier has altered considerably the aspect of cholera prevention, for we have to deal not only with real, but also with potential agents of infection. The high efficiency of present-day quarantine procedures has rendered the possibility of spreading infection from cholera cases extremely slight. The real danger to the public is not alone the person sick with the disease, but also the person infected with the specific organism and presenting no apparent symptoms of illness. In typhoid carriers the gall-bladder is known to be the storehouse of the infecting organism. That a similar condition may exist with cholera carriers is suggested by the observations of Greig, who demonstrated by cultural methods the presence of the cholera vibrio in the gall-bladder eighty-one times out of 271 cases of fatal cholera. In the prevention of cholera, besides the effective isolation of the sick, there has developed in the author's experience at quarantine the necessity of extreme caution in the release of contacts or fellow passengers from detention, before a routine bacteriologic examination has proved them free from the cholera vibrio, and even after such a routine procedure there remains always a possibility of the escape of a bacillus carrier who may have been examined during a negative interval of an intermittent discharge of the infecting organism.

When sporadic cases of cholera occur in any community (the so-called cholera nests) it would seem that the bacteriologic examination of drinking-water and of food, although advisable always, is not of the same importance as a diligent search for the true source of infection, the infected, presumably healthy person, the proper means for whose detection, although involving a State in great outlays of money and time, are of necessity justified in emergencies for the proper preservation of the public health and confidence.

The Operative Treatment of Elephantiasis scroti.—Taylor, of Yangchow (*China Medical Journal*, vol. xxvii, November, 1913, No. 6), describes a method of his own for operating upon elephantiasis of the scrotum. As the method is a new one and not mentioned in the usual text-books of tropical medicine, it may with convenience be given here. The procedure is as follows:—

Every endeavour is made to get the surface of the tumour clean. A one per cent. solution of lysol in hot soap water is applied vigorously with a brush, care being taken to get the cracks and crevices as clean as possible. This is repeated on the second day, and then the parts left in dry sterile dressing till morning of operation. While the anæsthetic is being given, the skin to be removed is rubbed with Harrington's Solution, which is essentially a strong solution of perchloride in acid alcohol; after this dries the whole region is painted with tincture of iodine. Should one fear the official tincture, which is seven per cent. in the U.S.P., to be too strong, it may well be diluted with alcohol to one-half. This coat of iodine is allowed to thoroughly dry before the draping is done. The tumour is now examined, and the limits of the elephantoid tissue are determined. A long rubber tube is wound tightly around the base of the tumour and fastened either by sterile bandages to a belt around the waist, or is held from slipping by towel clamps in the skin, one anteriorly in the pubic region, one in front of the anus, and one on each side, all, of course, being clamped below the tourniquet. The author likes this method of holding the tubing much better than the figure of eight around the waist, as it is necessary to unloosen this after the tumour is removed before finally closing the wound, and it is hard to prevent soiling of the wound while the helpers are doing this. He has had perfect control of hæmorrhage by his method.

As soon as the tourniquet is applied, a long sagittal incision is made from a point on pubes in good skin perpendicularly downward through the preputial opening along the median raphe to a point in good skin in the perinæum in front of the anus. This incision is first deepened over the canal where one expects to find the buried penis, until the preputial mucous membrane is found. As soon as this is reached, a circular cut separates the prepuce from the outer layers of elephantoid tissue. There is a line of cleavage running right down around the penis to its root, and it is a matter of a few moments only to thoroughly isolate the penis with its elongated mucous membrane canal forming a kind of foreskin deprived of its outer cutaneous layer. This mucous membrane is all carefully preserved, as it will be very useful in making flaps for the penis. The next step the author finds is one that makes the whole procedure safe and easy. Keeping carefully to the mid-line, the tumour is boldly bisected and each half laid over on its respective side. The testicles are approached from the median aspect, rather than from primary perpendicular incisions from the outside as usually recommended. They are nearer the median line than they are to the external surface, and the tissue here is far easier to work in. Carefully going in, the testicles and cords are one by one isolated, any hydrocele present being attended to, and then the two testicles are turned upwards along with the penis till the tumour is removed. The tumour tissue is separated well from these three structures, and then working outward towards the skin surface, the elephantoid tissue is cut away from the perinæum till the skin is reached. The author thinks that one is able to tell better, working from inside outwards, where the skin incisions must be, and as soon as the tumour is cleared away from the mid-line from the pubes anteriorly to the anus posteriorly one is ready to cut through the skin, thus releasing the whole tumour mass. The author has found it well to use a large number of clamps, and to clamp first, then cut.

As soon as hæmostasis is complete, the preputial mucous membrane is slit up as much as is necessary to turn it back, and is used for a part of the covering of the penis. The incision is closed horizontally across the pubic region down to the penis, and from here downward vertically, making a T-shaped closure. The testicles are placed in as normal a position as possible, and covered over with the flaps saved from the sides of the tumour. The everted mucous membrane is stitched to the edges of the skin, and the normal appearance of the organs after the operation is surprising.

This method of approach has these advantages. A minimum amount of work is done from the external surface of the tumour inward, and danger of infection is thus lessened. A large part of the work is done from the mesial surfaces of the bisected tumour, which are of course sterile. The heavy tumour has to be lifted very little. As it is cut in two, it falls apart, and rests between patient's legs on the table. It is gradually liberated by working from the mid-line externally, and from before backwards, with the tissues to be cut in plain sight, with good opportunity to clamp every bit of tissue before cutting, if desired, so that one should have to lose very little blood. The testicles are easily reached by blunt dissection with little danger of injury, and the cords are quickly isolated up as high as desired.

Drains are desirable in cases of this kind where there is a certainty of much oozing, and abundant dressings will tend to prevent subsequent infection. The administration of a urinary antiseptic such as hexamethylentetramin may help to prevent infection from spilled urine, and will do no harm. It is very convenient to have the bowels tied up for several days after operation.

Before attempting operation it is well to satisfy one's mind that there is no hernia present. If there should be, it may be attended to in the usual way before the scrotum is touched, and if there is reason to hope that the testicle on the other side is in good condition it is wise to ligate the cord high up in the ring, remove as much as possible through the hernial incision, make a tight closure of the inguinal canal, and finally remove the testicle with the stump of the cord through the scrotal opening. It will be very difficult to pull up the testicle from an elephantoid scrotum through the incision for the herniotomy, though one may often do this where castration is desired in other cases.

Parotitis and Malaria.—Myers, of Dominica, West Indies, describes a case of suppurative parotitis in a malarial subject (*British Medical Journal*, December 27, 1913). The following are his notes of the case. On September 11 he was called in to a case of malaria in a woman. It was of mixed quotidian and tertian infection, and ran a fairly high temperature (up to 105° F.). On September 17 the spleen was felt for the first time, and on the same day the courses came on, but lasted only one day. On September 20 the right parotid became suddenly inflamed, and remained so, sometimes worse, sometimes better, until October 2, when the pain, in spite of poultices and other anodyne treatment, became markedly more acute. There was no fluctuation as usual, and the swelling was definitely confined to the gland. On the same day, under cocaine (and strychnine) anæsthesia, he cut down on to the gland capsule, and opened the abscess with sinus forceps, evacuating about ½ oz. of "laudable" pus, and inserted a drainage tube 1½ in. long. The cavity drained well, and was practically healed by October 10. Meanwhile, under treatment with quinine and arsenic, the fever ran its usual course.

It should be mentioned that the patient had a decayed upper bicuspid tooth on the right side, which may have acted as an exciting cause. The left parotid showed a very slight inclination to be troublesome, but this soon subsided.

[There is no evidence that the suppuration had

anything to do with the malarial infection *per se*. If the patient had been anæmic and cachectic these conditions might have acted as predisposing factors, but no mention of these is made in the note. The two conditions were simply coincident, and the diseased tooth was evidently the focus from which the septic infection originated, and passed to the parotid.]

Argas and Spirochætes. The Granules of Leishman (by E. Marchoux and L. Couvy).—Two interesting memoirs on the subject of the behaviour of spirochætes in ticks, by the above-named authors, have appeared in Nos. 6 and 8 of the *Annales de l'Institut Pasteur*, 1913. In the first of these the authors give an account of the development of what may be called the granule theory of spirochætes. Dutton and Todd were the first to suggest that in ticks the spirochætes might have a developmental cycle comparable with that of certain protozoa. They showed that in *Ornithodorus moubata* the *Spirochæta duttoni* fragmented into granules which eventually appeared in the Malpighian tubes as small bodies having a diameter of 1 to 3 microns. They were of opinion that they had been able to trace the development of these granules into comma forms which vaguely resembled spirochætes. Leishman some years later drew attention to the segmentation of the spirochætes in the ticks. The resulting granules were found in the gut and cells of the Malpighian tubes. They occurred in the ovaries and in all the developmental stages of the tick from the egg to the full-grown adult. In the larvæ and embryos they occurred in those cells which were destined to give rise to the Malpighian tubes. If the ticks are incubated at a temperature of 34°-37° C. the granules elongate, and at the end of 8-10 days spirochætes appear in the Malpighian tubes and cæca. The inoculation of mice with the tissues of ticks, which contain no spirochætes but only granules, gives rise to an infection of spirochætes. Balfour pointed out that in *Argas persicus*, *Sp. gallinarum* underwent a similar development, with the result that all the organs of the ticks became charged with granules which were specially numerous in the Malpighian tubes. Incubation at 37° C. for a few days was enough to cause the granules to transform into spirochætes. If, however, the ticks are maintained at a temperature of 15°-20° C. after three or four days from their last feed all spirochætes have disappeared. Balfour was successful in producing infection by inoculating the organs of ticks which contained only granules. Fantham was able to confirm Leishman's observations, and gave a like explanation of the granules. Blanc, however, did not believe the granules to have any relation with the spirochætes. Hindle described a cycle for *Sp. gallinarum* in Argas. After ingestion by the tick the spirochætes passed through the gut wall into the body cavity, and thence made their way to the salivary glands and reproductive organs. In these organs, as also in the Malpighian tubes, the spirochætes segmented into granules (coccoid bodies). Incubated at 39° C., these bodies became transformed into spirochætes. The authors of the present memoir describe in detail the characters and distribution of the granules in *Argas persicus*. In the larval tick they are found in the Malpighian tubes, and in the adult in these tubes, and also in the ovaries and in the genital ducts of both the male and female ticks. The granules are always intracellular. In the fresh condition a portion of Malpighian tubes is seen to give out from its cells, if these are broken, small granular spherical masses. Coloured *in vivo* by thionin, methylene blue, or gentian violet, the substance of the spheres hardly staining, while the granules are intensely coloured. These granules are the granules of Leishman. In dried smears fixed in alcohol the substance of the masses stains blue with Giemsa stain, while the granules stain red, but it is in sections that one can best study the distribution of the granules. In the cells of the Malpighian tubes one notes that the granular spheres replace almost the entire cytoplasm, leaving, however, the nucleus uninvolved. In the epithelial cells of the genital ducts the granules are less numerous. In shape these are more or less ovoid, but may be bacilliform, or curved rods, two of which may be arranged together to form a kind of ring. It is these granules which are supposed, by the authors quoted above, to originate from the spirochætes ingested by the ticks. The authors referred to believe they have proved this: (1) By infecting animals by inoculating them with tissues containing only granules; (2) by tracing the forms connecting the granules with fully formed spirochætes; and (3) by showing that the granules are present in all infective ticks. Marchoux and Couvy have examined these points and have shown in the first place that it is impossible to inoculate granules without at the same time inoculating spirochætes. In examining for spirochætes if one relies on Giemsa staining, they may be apparently absent owing to the lack of intensity of the stain. By employing gentian violet, the authors have shown that even after a fast of eleven months at a temperature of 15° C. the cœlomic fluid of ten ticks still contained spirochætes, which were, however, very much finer than those originally ingested.

The experiment was varied by keeping ticks at changing temperatures (on ice and at laboratory temperature) for five months. In this case five ticks still contained spirochætes. An attempt was made to get rid of the spirochætes by feeding the ticks on a fowl which had been rendered hyper-immune to this particular spirochæte, but after a fast of nine months the ticks still contained spirochætes. No better result was obtained by injecting the hyper-immune serum directly into the body cavity of the tick. Thus all attempts at freeing the body cavity fluid of the ticks from spirochætes were failures. It was noted that with starvation of the ticks the spirochætes became much finer, so much so that they might very readily be overlooked. If the tick again feeds after starving the spirochætes commence at once to increase in length and thickness. If, however, the ticks are made to ingest

saline solution instead of blood, the spirochætes do not change, so that the growth is evidently a matter of nutrition. It has also been shown that the fine spirochætes are infective. It is only necessary for a drop of cœlomic fluid of the tick to contain a few of these fine spirochætes for a typical infection to be produced when injected into a susceptible animal. The authors thus prove that in the experiments quoted above wherein it was supposed that only granules had been injected, in reality some of these fine spirochætes had been responsible for the infection produced.

As regards the passage of spirochætes from the gut, it has been shown that twenty minutes after a feed on infected blood numerous normal spirochætes are present in the cœlomic fluid, drawn off by cutting across one of the limbs of the tick. Those spirochætes remaining in the gut undergo a change whereby the chromatin core becomes segmented. Contrary to the views held by other writers, the authors regard this as a purely degenerative change and not the first stage of reproduction in the tick. If spirochæte blood is kept aseptically in a tube at 28° C. for twenty-four hours, it will be noted that fragmentation occurs. At 37° C. the fragmentation occurs more rapidly, and it takes place also but more slowly when the blood is kept in ice. Similar changes can be produced by submitting the spirochætes to the action of specific anti-spirochæte serum outside the body of the host, and also occur when spirochætes are ingested by invertebrates other than their true transmitting host. The granules into which the spirochætes disintegrate have no great affinity for the stains, while the granules of Leishman stain intensely. The authors have never been able to obtain any evidence that these granules transform themselves into spirochætes under any conditions. Further, they do not agglutinate, as do the spirochætes, when subjected to the action of an anti-spirochæte serum. In injecting the tissues of ticks which are heavily charged with granules, infection does not always take place, so that the authors are led to believe that in those cases in which an infection has followed, it has not resulted from the granules, but from spirochætes which have not been seen.

In tracing the changes undergone by the spirochætes in the intestine of the tick, the authors have found that by puncturing the dorsum of the tick an intestinal hernia results, and from this, by means of a fine pipette, intestinal fluid can be drawn off for examination. After eighteen hours the majority of the spirochætes have still their original activity, though some stain rather faintly and others show some indication of fragmentation. In twenty-four hours, in addition to spirochætes still apparently normal, one observes large masses of agglutinated organisms. Spirochætes may be observed to rest with one extremity fixed to some larger object. During this period of rest the body of the spirochæte appears to attract to itself granules of a refractile character which are moving in the liquid. These granules attach themselves to the spirochætes, but directly there is the slightest movement on the part of the spirochæte or the fluid medium the granule may give one the appearance of escaping from the interior of the spirochæte. The movements of many of the spirochætes at this time cease entirely, and one may observe a veritable lysis of the organisms. Stained preparations show that at this period there are many spirochætes with fragmented chromatin. After the lapse of forty-eight hours the number of normally motile spirochætes has still further diminished, but the majority have the fragmented chromatin. A great many are evidently degenerate, and on the bodies of some there are little swellings like herniæ. After three days practically all the spirochætes are immobile. Some have still intermittent motility, and some have entered the red blood corpuscles (of the bird), and are seen to swim around the nucleus like fish in an aquarium. In stained preparations one sees numerous scattered granules, some undoubtedly derived from the spirochætes, but others from the disintegrated red cells, so that it is not possible to be sure of their origin.

After four days the blood ingested has been almost completely hæmolysed, and there are seen abnormal spirochætes—some fine, others short and stumpy and very motile, while the spirochætes of normal dimensions are quite motionless and all fragmenting. After five days the number of motile abnormal spirochætes has increased. After six days the abnormal spirochætes are still present, but show some tendency to agglutination. In seven days very few spirochætes are present, while on the eighth day they have generally disappeared entirely from the gut. Sometimes, however, the complete disappearance may not take place till the twelfth day. After this they never reappear in the cæca of the gut.

Similar changes in the spirochætes have been shown to take place in bugs and leeches, which are not the true hosts of the spirochætes. The spirochætes fragment as they do in the tick, but the Leishman granules never appear.

The authors then go on to explain the presence of the abnormal spirochætes which appear in the gut after the fourth day. That they have not returned to the gut from the cœlomic fluid is shown by the following experiments. Ticks were used in whose cœlomic fluid spirochætes were fairly numerous, but which contained no spirochætes in the intestinal cæca. The ticks were then fed on a healthy animal and the gut tapped daily afterwards, with the result that spirochætes never reappeared in the gut, as they should have done if they were able to pass from the cœlom. The abnormal forms met with in the gut are thus the result of the digestive process on the normal spirochætes. During the process of digestion in the bug and leech similar abnormal spirochætes appear, as they do also in the blood which is kept aseptically in tubes. It seems that these abnormal forms are produced as a result of defective nutrition, and finally, when the digestive process is nearly complete, they also agglutinate and perish.

The authors then ask the question as to what

are the granules of Leishman which stain so intensely in contrast to the granules produced by the fragmentation of the spirochætes. The granules of Leishman certainly vary in form with the change of temperature of the tick. At 37° C., after a few days, many of the granules become rod-like and may have a length of 2 to 4 microns. After five days at this temperature no further change takes place, but some of them have the form of vibrios with a length of 9 to 11 microns. These changes, which are produced most readily by warmth, occur also, but to a less extent, at the lower temperature, 15 to 18° C. Though the granules change in this way and even show elongation with undulations, it is impossible to confuse them with spirochætes, into which they never become transformed. The granules, whether kept at a low or high temperature, are not agglutinated by a specific serum, nor is infection produced in susceptible birds by their injection, the apparently positive results being explained by the presence of unrecognized spirochætes. Though in bugs and leeches the spirochæte fragmentation takes place as in the tick, repeated feeds on infected animals never give rise to the Leishman granules. Further, these granules exist in many other animals, and have been found in *Argas vespertilionis*, *Rhipicephalus sanguineus*, *Dermacentor reticulatus*, *Hæmaphysalis concinna*, *Amblyoma variegatum*, *Ixodes ricinus*, and *Lælaps echidninus*. The authors find it difficult to admit with Hindle that in all these invertebrates the granules have really originated in spirochætes taken up by these animals from their vertebrate hosts. They discuss the possibility of their having a bacterial nature, but do not favour this view. It is possible they are mitochondria or pre-secretory granules.

In the second memoir the authors describe experiments undertaken to test the infectivity of the ticks. It was found that the inoculation of a bird with the crushings of two infected argas sometimes produced a typical spirochæte infection, but most usually produced an immunity without infection. Sometimes the injection of a minute portion of a tick is sufficient to render the bird immune to subsequent inoculation. It might be suggested that this immunity was produced by the injection of antibodies present in the tick, but this was shown not to be so by the fact that after filtration through a porcelain filter the material no longer produced immunity. This is due to the removal of spirochætes, as is also shown by the fact that the exposure of the crushed organs of the tick to a temperature of 55° C. deprives it of its infecting or immunizing power in the same time as virulent infected blood loses its infectivity under the same conditions. The immunity results from a vaccination, for, working with infected blood, the authors have found that the intramuscular injection of 20,000 spirochætes will produce infection, 1,700 a vaccination, while 700 have no effect. By the intravenous method 17,000 will produce infection, while 70 will give immunity. Tables giving the details of the various experiments are appended. Working with the very susceptible embryo of the chick while still within the egg it was found that the injection of thirty spirochætes into the egg produced certain infection. In the light of these results it was easy to explain the varying results obtained by the injection of crushed ticks. By a counting method it was shown that, as with the blood, the result obtained varied with the number of spirochætes in the crushed ticks employed. The authors then examined the method of infection by the tick. In the Argas, apart from the glands connected with the sexual organs, there exist two pairs—the salivary glands and the cephalic glands. The former open by a duct at the base of the hypostome. The cephalic glands exist only in the female tick, and serve to lubricate the eggs at the moment of laying. The duct opens at the base of the rostrum. In the Argas coxal glands are absent, and the fluid which can be obtained by compression of the tick is really cœlomic fluid which has filtered through a thin chitinous plate. Leishman's view was that in *Ornithodorus moubata* at ordinary temperatures the salivary glands are not infected, but that infection is produced by the secretion from the coxal glands contaminating the wound. Hindle believed that neither the salivary nor coxal glands were responsible, but that infection resulted from regurgitation of gut contents or soiling of the wound with excreta diluted with the fluid from the coxal gland. Hindle also showed that spirochætes were present in the salivary glands six hours after a feed, but that the spirochætes rapidly disappeared from them, and were never found after a long fast.

Marchoux and Couvy record experiments whereby they infected birds by means of ticks which certainly neither passed excreta nor fluid from coxal or other gland while feeding. Examining salivary glands of ticks, they found that only exceptionally were spirochætes present after a fast of two weeks. But by careful isolation of the salivary duct they have discovered that spirochætes are always present in this, and can be readily seen both by staining or by the ultra-microscope even after prolonged starvation. If, however, before dissection the tick is allowed to feed it will be found that practically all the spirochætes have disappeared from the salivary duct. A few days later, however, spirochætes become numerous in the acini of the gland. They again disappear from the gland and pass into the salivary duct, where they accumulate and attain their maximum on the tenth to fourteenth day. By repeated feeding the number of spirochætes increases, so that a tick in whose salivary duct there may have been too few spirochætes to produce infection at the first feed with multiplication of these the tick may become infective at a subsequent feed, for, as already shown, the result depends directly on the number of spirochætes injected.

In addition to spirochætes in the salivary apparatus others are constantly present in the cephalic glands, the secretion from which lubricates the eggs at the time of laying. It was thought that herein was an explanation of the hereditary transmission of spirochætosis in the tick. It was easy to

demonstrate that spirochætes could pass through the egg membranes by plunging freshly laid eggs into infected blood, so that egg infection is most probably produced by the infected fluid from the cephalic glands. This would account for the irregularity in the egg infections. The spirochætes in the eggs are often very fine and difficult to see. Injected into birds twenty eggs were able to produce immunity, but not infection; but two eggs injected into the more susceptible embryo chick produced infection. By a most careful examination of eggs it was found that two out of five contained each more than thirty spirochætes. The authors believe that within the egg, as in the cœlomic fluid, there exist beyond the spirochætes that are visible others that are still finer and invisible.

The conclusions are as follows:—

(1) The injection of a uniform quantity of crushed tick gives sometimes infection, sometimes immunity.

(2) The infecting power depends on the number of spirochætes in the tick.

(3) It is possible to measure the various doses—infecting, vaccinating, inactive.

(4) All the organs of the tick are invaded by spirochætes.

(5) The spirochætes pass from the cœlom into the acini of the salivary glands, and thence into the salivary duct.

(6) The salivary fluid is the vehicle of infection.

(7) Spirochætes occur in large quantity in the cephalic glands, and are able to pass through the chitinous membrane of the egg.

(8) The eggs of Argas contain spirochætes. A single one may contain as many as thirty.

Drugs and Appliances.

"Zana Baths," prepared by immersing the aerating cushions supplied by the Hygienic Company, Ltd., 36, Southwark Bridge Road, London, S.E., are an excellent substitute for the Nauheim Bath. Nascent carbonic acid gas is liberated in the bath. For use in the Tropics the Zana bath is not only most refreshing at all times, but in many skin affections, such as prickly heat, in which the use of soap is deleterious, the Zana Bath is soothing and curative.

Peat Products (Sphagnol), in the form of soap and ointment, have proved useful as a preventive and a means of alleviating prickly heat. For the bites of mosquitoes, sand-flies, and other tropical pests of the kind the preparations are efficacious in relieving the irritation. For dhobie itch and the skin affections due to excessive perspiration, attacking especially the axilla and perineum, Sphagnol in its several forms as ointment, soap, and sphagnoline (an emollient toilet cream) is useful. Peat Products (Sphagnol), Ltd., 18, Queenhithe, Upper Thames Street, London, E.C., supply these preparations.

Ungt. "Cycloform" Co. (Bayer), supplied by The Bayer Co., Ltd., 19, St. Dunstan's Hill, London, E.C., is a derivative of benzoic acid and extract of witch-hazel, possessing anæsthetic, antiseptic, and astringent properties. It is useful in pruritic affections of the vulva, whether due to old age or diabetes, and has a beneficial effect on congested and painful piles. In excoriations of the anus, and in the irritations of the anus and rectum associated with dysentery and the later stages of sprue, the ointment helps to allay the agony which frequently obtains.

Messrs. Burroughs Wellcome and Co.'s exhibition of drugs was a prominent feature at the Congress of the Far Eastern Association of Tropical Medicine, held at Saigon, in November (8 to 15), 1913. Especially noticeable was the equipment for the treatment of cholera, consisting of a compact and thoroughly practical outfit adapted to carry out the method of transfusion of hypertonic saline solutions devised and applied by Major Leonard Rogers. "Tabloids" containing suitable doses of emetine hydrochloride for use in dysentery, hepatitis and threatened liver abscess, and a sterile solution—"Vaporole" emetine hydrochloride in hermetically sealed containers ready for immediate injection—engaged the close attention of those practising medicine in the Tropics. A variety of "tabloid" medicine chests and cases and first-aid equipments proved attractive to travellers and others in the Far East.

Hypophysen Extract (Schering), a preparation of the fresh glandular substance of the infundibular part of the pituitary gland, made up in ampoules containing 8 and 15 minims each, for hypodermic use, is efficacious in several uterine derangements. In insufficiency of labour pains, in *post partum* hæmorrhage, and as a hæmostatic in menorrhagia, hypophysen acts promptly and efficaciously. Schering's preparation is obtainable from A. and M. Zimmermann, 3, Lloyd's Avenue, London, E.C.

"Bynin" Amara, the well-known preparation by Messrs. Allen and Hanburys, 37, Lombard Street, London, E.C., must especially commend itself to practitioners in the Tropics in cases of convalescence after illness and on recovery from an attack of malaria. Its composition: Quinine phosphate, gr. 1½; iron phosphate, gr. 2; nux vomica alkaloids equal to strychnine phosphate, gr. 1-16th; and "Bynin" liquid malt, 1 oz. Dose: a dessert to a tablespoonful thrice daily before meals.

Cystopurin.—A. Wulfing and Co., 12, Chenies Street, London, have introduced Cystopurin as a means of treatment for affections of the urinary tract. It is a modified form of hexamethylene-tetramine (a compound built up of formaldehyde and ammonia). Cystopurin is an addition product of hexamethylene-tetramine and sodium acetate in the proportion of 1: 2—a molecular hydrated combination. It is put up in 15-gr. tablets.

It is claimed for Cystopurin that it clears up cloudy and offensive urines; bacteria in the urine are killed, and gonorrhœa and its complications are beneficially affected. We can endorse the claims put forward for Cystopurin by practical clinical experience of this remedy.

Cod-Liver Oil Preparations.—Messrs. Allen and Hanburys, 37, Lombard Street, London, E.C., issue special circulars concerning their preparations of cod-liver oil. The excellence of these is well known. The plain cod-liver oil is made as nearly tasteless as possible; the Allenburys malt and cod-liver oil preparation known as "Bynol" is an elegant combination of these two most nutritive agencies in which the taste of the oil is completely covered; and "Bynin" emulsion contains, in addition to oil and malt, hypophosphites of lime and soda. "Bynin" is a liquid malt preparation, and Messrs. Allen and Hanburys have combined it with many drugs and assigned a name to each significant of the principal ingredients of the combination; thus: Bynin amara contains nux vomica in suitable dosage; B. cascara contains cascara sagrada and rhamnus frangula; B. formates, formates of iron, lime and soda; B. glycerophosphates include iron, lime, potash, magnesia and soda glycerophosphates. Besides these we find Bynin Hæmoglobin; B. hypophosphites; B. lecithin; B. pancreatin; B. pepsin; B. phosphates; B. plasma and others. Each and all of these preparations have their several uses in individual cases of illness, and all have proved efficacious and reliable compounds.

Reviews.

A Manual of Practical Chemistry for Public Health Students. Especially arranged for those studying for the D.P.H. By Alan W. Stewart, D.Sc., Assistant Demonstrator of Chemistry at the Royal Institute of Public Health, London. 3s. 6d. John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1913.

Practical chemistry being one of the most important subjects for public health students, it is essential that they should possess a suitable manual on the subject. Dr. Stewart has therefore designed a little book to supply in a concise manner the necessary practical chemical exercises for D.P.H. students. It has been his aim to produce a cheap book which shall also be as complete as is required by students for the D.P.H., for whom it has been especially written. Though a manual, it contains all that is required, as the table of contents shows. Part I deals with acidimetry and alkalimetry. Part II with air analysis, estimation of oxygen in air, estimation of carbonic acid in air, the detection of poisonous gases. Part III, with water analysis, sewage and sewage effluents. Part IV with analysis of foods and beverages, analysis of milk, butter, coffee and chicory, flour, beer, spirits. Part V with disinfectants and preservatives, estimation of carbolic acid in carbolic powder, estimation of salicylic acid in lime juice, tests for disinfectants and preservatives. Part VI with microscopical work; and then there are remarks on useful data and examination questions.

The book should certainly prove useful to the class of student for whom it is intended. The information is well put together, and as the manual is small it can easily be carried about in the pocket and used as opportunity arises.

It is unfortunate that there is such a large list of errata, no fewer than nine of these, some very important, appearing before the first chapter. These, of course, will be suitably dealt with when the book runs to a second edition, which we have no doubt it will soon do. The manual may be thoroughly recommended for public health students in general and especially for those going in for the D.P.H. diploma.

The Medical "Who's Who" for 1914. Crown 8vo., pp. 812, xxv. 10s. 6d. net. The London and Counties Press Association, Ltd., 39, King Street, W.C.

From the preface we learn this is the third issue of this bulky volume, and it may therefore be assumed it has filled a niche and found a recognized place on the shelves of many professional and non-professional people. In addition to much of the information which appears in *Churchill's Medical Directory*, it contains various other particulars, such as speciality, recreation, clubs, &c., and in some cases a short *résumé* of work done and posts occupied. We judge the volume contains somewhere about 7,000 names; if the whole 40,000 names, or thereabouts, of the members of the profession are included, as we infer the publishers are prepared to do, unless something is done to keep the information within bounds the bulk of the volume will be appalling.

Notes and News.

MOSQUITO DESTRUCTION IN QUEENSLAND.

Statistics prepared by the Health Department show that during the week ended October 11 the mosquito squad oiled some 39,110 square yds. of natural breeding places. These included 10 swamps and 13 other collections of water; 317 houses were inspected, with the result that only 68 properly screened tanks were found; 277 tanks were not screened; 2 pools of water were found to be breeding mosquitoes on private premises; 92 houses were re-inspected, and 55 tanks found to have been screened, 4 wells drained, and 6 tanks removed.

Personal Notes.

INDIA OFFICE.

From November 8 to December 13.

Arrivals Reported in London.—Lieutenant-Colonel G. B. Irvine, I.M.S.; Major W. H. C. Forster, I.M.S.; Captain F. H. Salisbury, I.M.S.; Captain J. O'Leary, I.M.S.; Lieutenant-Colonel P. B. Haig, I.M.S.; Captain V. N. Whitamore, I.M.S.; Captain S. S. Vazifdar, I.M.S.; Major J. K. S. Fleming, I.M.S.; Captain W. S. J. Shaw, I.M.S.; Lieutenant-Colonel J. H. Hulbert, I.M.S.; Major D. McCoy, I.M.S.; Captain C. L. Dunn, I.M.S.

Extensions of Leave.—Lieutenant-Colonel G. Bidie, M.D., F.R.C.S.E., I.M.S., 4 d.; Captain J. Woods, I.M.S., 14 d.; Captain N. N. G. C. McVean, I.M.S., 4 m., M.C.

Permitted to Return.—Captain W. P. G. Williams, I.M.S.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Heriz-Smith, Lieutenant G. V., I.M.S., to October 5, 1914.
Irvine, Lieutenant-Colonel G.B., I.M.S., to October 14, 1914.
Nauth, Lieutenant-Colonel B., I.M.S.
O'Leary, Captain J., I.M.S.
Pilgrim, Lieutenant-Colonel H. W., I.M.S., to May 10, 1914.
Roe, Colonel R. B., I.M.S.
Salisbury, Captain F. H., I.M.S.
Shand, Captain J. G. B., I.M.S., to January 24, 1914.
Shortt, Captain H. E., I.M.S.
Veale, Lieutenant P. J., I.M.S., to June 8, 1914.
Vazifdar, Captain S. S., I.M.S., to October 19, 1914.
Whitamore, Captain V. N., I.M.S.
Durham, Lieutenant W. R., I.S.M.D., to April 30, 1914.
Fleming, Major J. K. S., I.M.S.
Stevenson, Surgeon-General H. W., C.S.I., I.M.S., to January 10, 1914.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Crossle, Captain H., I.M.S, N.-W. F. Prov.
Fayrer, Major F. D. S., I.M.S.
Forster, Major W. H. C., I.M.S., 24 m., October 10, 1913.
Haig, Lieutenant-Colonel P. B., I.M.S.
Morgan, Major E. J., I.M.S.
Pridmore, Lieutenant-Colonel W. G., I.M.S., Burma, 24 m., December 11, 1912.
Rainier, Major N. R. J., I.M.S.
Stevenson, Captain W. D. H., I.M.S., Bo. Bacteriological Laboratory.
Shaw, Captain W. S. J., I.M.S.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

December 4, 1913.

Deaths.—None.

Transfers.—K. McGahey, L.R.C.S. & P.Edin., L.F.P.S. (Glas.), D.P.H.Ireland, Medical Officer, Northern Nigeria, has been appointed Senior Sanitary Officer in Ceylon.

Resignations.—None.

Retirements.—P. H. Macdonald, M.B., C.M.Edin., Medical Officer, Southern Nigeria, retires on pension; R. C. Hiscox, L.R.C.S. & P.Edin., L.F.P.S.Glas., M.D., C.M.Toronto, D.T.M.Liverpool, Medical Officer, Southern Nigeria, retires on pension; M. W. Manuk, M.B., C.M.Edin., D.T.M.Liverpool, retires on pension; J. D. Finlay, M.B., C.M.Glas., Medical Officer, Southern Nigeria, retires with a gratuity.

New Appointments.—The following gentlemen have been selected for appointment to the Staff: W. E. Glover, M.B., Ch.B.Aberdeen, D.T.M. & H.Camb., Southern Nigeria; H. H. Stewart, M.B., B.S.Edin., Southern Nigeria; W. E. S. Digby, M.R.C.S.Eng., L.R.C.P.Lond., Northern Nigeria; J. W. B. Hanington, M.D., C.M. McGill Univ., M.C.P.S. Newfoundland, M.R.C.S.Eng., L.R.C.P.Lond., Northern Nigeria; C. R. Patton, M.B., Ch.B.Edin., Gold Coast; H. McC. Hanschell, M.R.C.S.Eng., L.R.C.P.Lond., D.T.M.Liverpool, D.T.M. and H. Cambridge, Gold Coast; R. H. Miller, M.R.C.S.Eng., L.R.C.P.Lond., M.R.C.V.S.Edin., Gambia.

Other Colonies and Protectorates.—R. F. Russell, M.B., B.Ch. Aberdeen, has been selected for appointment as a supernumerary medical officer, Jamaica.

W. Tudhope M.B., Ch.B.Glas., E. N. Russell, M.B., B.C., B.A. (Cantab), M.R.C.S.Eng., L.R.C.P.Lond., H. H. V. Welch, M.B.,B.S.Lond., M.R.C.S.Eng., L.R.C.P.Lond., and F. Collar, M.R.C.S.Eng., L.R.C.P.Lond., have been selected for appointment as temporary medical officers, East Africa Protectorate.

H. W. Catto, M.B., B.S. Lond., M.R.C.S.Eng., L.R.C.P. Lond., has been selected for appointment as an Assistant Bacteriologist and Pathologist in the Medical Department of Jamaica.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

Bulletin of Entomological Research.—The November number of the Bulletin (vol. iv, Part 3, pp. 151-254) contains the following papers: "A Proposed Method of Controlling the Ravages of Leaf-eating Caterpillars," by G. C. Dudgeon. "New Synonymy in Oriental Culicidæ," by F. W. Edwards. "A List of Uganda Coccidæ and their Food-plants," by C. C. Gowdey. "Entomological Pests and Problems of Southern Nigeria" (Plates xxiii-xxviii), by A. D. Peacock. "Entomological Research in British West Africa—IV. Sierra Leone" (Plates xviii-xxii and map), by J. J. Simpson.

ERRATUM.

OWING to a regrettable printer's error "British Guinea" was unfortunately inserted for "British Guiana" in THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, November 15, 1913. The title of Minett and Field's paper should therefore have read: "Notes on a Case of Dermal Leishmaniasis in British Guiana," and not in "British Guinea." Dr. Wise, of British Guiana, has written pointing out the error as being misleading and unfortunate.

Notices to Correspondents.

1.—Manuscripts if not accepted will be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

NOTE OF A CASE OF LIVER ABSCESS TREATED WITHOUT OPERATION.

By J. Bell.

Superintendent, Civil Hospital, Hong Kong.

A. D., aged 26, European, was admitted to hospital suffering from fever. He had had a slight attack of dysentery two months previously.

His liver was considerably enlarged, especially upwards, with tenderness on pressure, and pain in the right shoulder.

The temperature continued for several days, and was of the hectic type.

As there was no improvement in his condition, Dr. Moore, Assistant Superintendent, examined the liver with an aspirating trocar, and the first puncture showed pus of the typical kind.

Nothing further was done, but the patient was put on a daily injection of emetine ⅓ gr., and under this treatment all the symptoms cleared up rapidly, and the patient is now—six months afterwards—well and at work.

Remarks.—This case is reported as the emetine treatment of dysentery, and liver abscess does not seem to have received the recognition it deserves (*vide* Journal of Tropical Medicine and Hygiene, November 15, 1913, p. 345).

We have since had two typical cases of amœbic liver abscess, both of which have recovered without any treatment but injections of emetine.

PSITTACOSIS.

By T. P. Beddoes, F.R.C.S.

(Psittacosis—from the Greek word, *psittacos*, a parrot.)

It fell to my lot, in 1893, to be called in consultation to an aunt and niece with symptoms of pneumonia. The history was that the brother of the younger patient, an officer of a tramp steamer, had brought home a parrot, which had been with other parrots under the care of the sailors. One sailor was said to have been sent to hospital at Bordeaux with supposed typhoid fever. A second had been admitted to hospital at Liverpool with supposed typhoid.

The account given was that, on arriving at the house a fortnight before, the parrot seemed out of condition, but never at any time likely to die. When the two patients became ill, a week before, the bird was killed and the body disposed of. This was done because the two sailors had been sent to hospital from the ship and other sailors were out of health on arrival. Also, the ship's officer believed that disease could be carried from parrots to humans.

Both my patients had symptoms of pneumonia, slight expectoration, not prune-juice-tinted or blood-tinged. The special feature of the case was the marked prostration. The aunt, aged about 70, died; the niece, aged 30, recovered.

The only bacteriological examination was for tubercle, not found.

The evidence that it was an infection from a parrot caused me to watch for all accounts of similar cases. At various times epidemics of psittacosis have been described in Continental literature; the causative bacillus, *B. psittacosis*, discovered by Nocard in 1892, is known to English pathologists. (Hewlett, "Manual of Bacteriology," Second Edition, p. 381; Hayes, vol ii, p. 271.) It belongs to the Gärtner group of paratyphoid bacilli.

A good account of the disease is that of Gilbert and Fournier, in "Nouveau Traité de Médecine et de Thérapeutique," in the volume devoted to "Diseases Common to Man and Animals." These authors isolated the bacillus from humans in Paris, in 1897, during an important and fatal epidemic resembling typhoid fever, with early and rapidly developing severe lung complications. Cases are recorded of transmission of the disease from man to man.

The average incubation period is eight or nine days. The onset occurs with weakness, shivering, loss of appetite, nausea, intense headache, vomiting, bleeding from the nose and slight diarrhœa. Sore throat and membranous stomatitis have been noticed.

In four or five days, sometimes as early as forty-eight hours, the temperature reaches 39° C. (102·2° F.) to 41° C. (105·8° F.) and remains at that level with but slight morning remission.

Thirst, nausea and vomiting persist; intestinal troubles are often almost absent; the abdomen remains flat, there is no gurgling in the iliac regions, constipation is marked. The urine is scanty, highly coloured, and often contains a large amount of albumin. The patients are distinctly prostrated, with either stupor or more commonly muttering, or continued delirium.

In the lungs there is general bronchitis with basic congestion, broncho-pneumonia, pneumonia with or without pleurisy. These symptoms are early and constant. By their intensity and extent they are the main cause of death. Partly by direct action, as well as their effect on the heart and circulation, they cause a fatal termination in a third of the cases, with a temperature of 41° C. (105·8° F.) or over, marked dyspnœa and terminal coma occurs usually in the second or third week. The prognosis is always serious, especially in the aged, and when there is pre-existing heart or kidney trouble, obesity or diabetes.

Diagnosis of psittacosis is difficult clinically in cases without a history of association with parrots, except in epidemics. It is apt to be confused with influenza having pulmonary complications and with other paratyphoid infections.

The bacillus is short, with rounded ends, motile with 10 to 12 flagella, aerobic and anaerobic, easily cultivated on the usual media, not liquefying gelatine, easily coloured and Gram-negative. Does

not coagulate milk or produce indol. It grows on gelatine and on potato.

One drop of culture is fatal to parrots in ten to twelve hours. Mice, rabbits and pigeons are equally susceptible; guinea-pigs and dogs are more resistant. Parrots are easily affected by placing in their cages the wings of those that have died of the disease, and by moistening their food with infected culture media. The bacillus long retains its vitality and virulence in dead animals and in culture media.

Infected parrots sit huddled up and motionless on their perches, with their feathers ruffled and wings drooping. They suffer from diarrhœa, refuse their food and are in a constant state of drowsiness.

In parrots the bacillus is found in the blood, viscera, in the intestine and bone marrow. The dejecta are especially dangerous, on account of the number of bacilli they contain. In man it is found *post mortem* in the heart blood. The agglutinating power in man is feeble (1 in 10 to 1 in 60), it varies with the stage of the disease and soon disappears. It is more marked in animals slightly affected. Typhoid serum slightly agglutinates the *B. psittacosis*.

The treatment should be conducted on general principles, as in other typhoid conditions, especial precautions being taken to guard against pulmonary complications.

TREATMENT OF CHRONIC ULCERS OF THE LEG WITH FROG FLESH POULTICE.

Note by Lim Boon Keng, M.B.Edin.

In a tropical practice, especially in connection with mining or planting operations, the rapid treatment of ulcers of the legs assumes an economic importance not to be neglected. For many reasons neither the coolies nor the employers of labour like the rest in bed which is so conducive to rapid recovery. Experience teaches that as soon as pain has subsided most coolies prefer to return to work, with the result that simple ulcers become chronic and callous and take months to heal.

The present writer has treated quite a number of chronic ulcers with a cold poultice made from the flesh of freshly killed frogs. Pain and irritation subside in a couple of days, and new skin and healthy granulations grow rapidly. Even the chronic ulcers of tubercular leprosy yield to this simple treatment: in one case reported by me fifteen years ago to the local branch of the British Medical Association, the leprous sores on the malleoli of both legs healed up completely in three or four months after having resisted antiseptic and other treatment for years at the hands of the élite of the local profession. Rest was not insisted on in any of my cases.

The Procedure.—Thoroughly cleanse the ulcer with sterilized water so as to exclude the possibility of a claim that antiseptics used may have an effect on the future cure.

Kill two or three large frogs (*Rana esculenta*), remove the skin, having previously washed the animals in sterilized water. Remove the head with the mouth, pharynx and intestinal organs with stout scissors and remove the flesh from the femora and back. Pound the flesh in a clean mortar and spread on muslin and apply to the sore. Sometimes I have used the bones too.

The Rationale.—The explanation of the clinical fact has not been worked out in detail. What part the frog serum or the white cells of the frog blood play in the healing process I have not had time to investigate; but the successes indicate that the application stops bacterial activity and enables the reparative process to proceed without hindrance.

Cholera Bacilli in the Lung.—Greig (*Indian Journal of Medical Research*, vol. i, No. 2, October, 1913) reports the cultivation of the comma bacillus from the lungs in a case of cholera. This, as the author states, supports the view that the blood is invaded by the cholera germs in a certain percentage of cases of that disease. After invasion of the blood the distribution of the cholera vibrio in the tissues becomes extended greatly, and consequently the possible channels of escape from the body will be increased. The latter circumstance makes it all important particularly from the point of view of prevention of cholera to collect as much information as possible in regard to blood infection by the cholera vibrio. It may be mentioned, in support of the proposition that a blood infection occurs in cholera, that the comma bacillus is eliminated by the kidneys and leaves the body in the urine. It was shown recently by the author that the cholera vibrio occurs in the urine of a certain number of patients suffering and convalescent from cholera. In the present case sections of the kidneys were made and the presence of an organism having the morphological characters of the comma bacillus was demonstrated in them.

As Greig has previously shown, the cholera vibrio is found frequently in the bile of fatal cases of cholera. In the present cases a culture on ordinary agar was made from the bile, with aseptic precautions, and the cholera vibrio was shown, by the usual tests, to be present. The discovery of the cholera vibrio in the bile of this case raises the interesting questions as to whether the organism reached the bile *via* the blood-stream, or whether it gained access to it from the alimentary tract, *via* the bile-duct. In a future communication dealing with his experimental and historical researches on the gall-bladder and biliary passages in cholera Greig will refer to this important question again.

Beriberi in New Jersey (*Medical Record*, January 17, 1914).—A report from Surgeon-General Blue, of the Public Health Service, shows that during the last three years there have occurred in the county jail at Elizabeth, N.J., twenty-two cases of beriberi. The investigation showed that at one time all of the inmates of the jail who were serving sentences of over sixty days had contracted the disease.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 2, 1914.

IMPORTANCE OF STUDYING THE MINERAL CONSTITUENTS OF OUR FOOD.

MINERAL substances in our foodstuffs have been neglected in their importance for the organic substances, such as proteids, fats, &c., yet there is little doubt that they are as important as are their organic associates in the dietary of man and animals. The tendency is—nay, it is the rule—that our foodstuffs are tampered with in some fashion by manufacturers and traders, and if this interference with natural food is to continue, which to all appearances it must, it behoves us to determine in what way the artificial food is to prove most satisfactory. Rightly or wrongly beriberi, for instance, is ascribed to rice, but at any rate it does seem proved that the substitution of unhusked rice for polished rice acts as a preventive or a cure.

We may also cite the present condition of wheat flour in our markets. Some twenty-five years ago the producers of flour substituted the "rolling" in place of the old "milling" process, and whilst thereby helping to add to the whiteness of flour, the flour was detrimentally affected in its nutritive value by the exclusion of important mineral constituents. This desire for white flour has even gone further, and much of the "fine white" flour exposed for sale has had its value as a food agent impaired by a process of bleaching by such agents as the trader may select. Inferior rice also has its defects caused by placing it along with some substances calculated to give a gloss, such as paraffin and talc in specially constructed revolving drums. It is easy to enumerate other detrimental processes applied to almost every food and drink on our tables, including sweets, jams, wines, &c., so that, whether by omissions of useful ingredients from our food, or by the addition of unwholesome substances or salts, soluble or insoluble in their nature, the sins of omission and commission of present-day traders are many and widespread. Proteins, fats, and carbohydrates in the lists of manufacturers' advertisements are given due prominence, whilst the salts necessary to their digestion are neglected for the most part, or when salts are added it is more than doubtful that they are selected on any real scientific basis, but rather in an empirical fashion, for which there is but little or no justification. Yet the importance of the minerals in our food, be it fluid or solid, is incontestable. Experiments show that certain bacteria require special media for cultivation, that certain marine animals can thrive only in certain places of the ocean, and that by depriving the sea water of particular salts of, say, potassium the animals die. Deprive the child of certain salts and rickets ensue; supply the necessary ingredients and the condition disappears. In the same way the power of resisting disease, be it in temperate or tropical climates, is largely dependent upon the food supplied, and the salts necessary for the maintenance of health play a part as important as any other constituent. To no section of the community is this question of "composite" food of more importance than to the European in the Tropics. In many parts tinned foods are the sole diet, and in several parts of the West Coast, what are called the unhealthy parts, is this the case; and there can be no doubt that the unhealthiness is largely due to the loss of the resisting powers being lowered by the deprivation of some ingredient in the food supplied. What that is we have to rely upon experience rather than upon chemical knowledge owing to want of investigation of the salts necessary. Why one tribe of natives attains dominance over its neighbours is usually attributed to disease, and quite rightly so when the matter is studied superficially; but were the matter sifted more deeply the supremacy would be found to be due to the powers of a certain tribe to resist disease, and this power may as often as not be due not so much to the presence of certain carriers of disease, but to the presence of certain qualities of their food. The soil, therefore, has to be studied, the soluble salts in the water, the fruits and the vegetables have to be sought for if truly scientific conclusions are to be arrived at to account for the geographical distribution and prevalence of disease. This inquiry need not in the first instance be a world-wide inquiry; for the individual inquirer, the practitioner

in the Tropics can even within a restricted area be able to give us valuable information; an even cursory inspection of the difference in the soil, water, food, and fruits used by adjacent peoples who show one the proclivity to excel and the other to degenerate would advance this subject and help to place it on a basis from which more extended inquiry could be made. We are now aware that disease accounts for the disappearance of the physical and mental efficiency and supremacy of any race or nation, but let us go further and try to determine if the inroad of that disease was not due to some change in their power of resistance, be it in soil or food; and this can only be accomplished by endeavouring to find what constituent is wanting and how it can be scientifically supplied to prevent the physical deterioration consequent upon its deficiency. In our day we have seen the teeth of the peoples of Northern Europe, at any rate, decay in a manner which is certain to end in disaster; for no nation can rear a healthy race with decayed teeth in their jaws; directly and indirectly they lead to ill-health, to a digestion which is faulty, and which means to succeeding generations a physical decay which must lead to loss of supremacy in the affairs of the world. What constituent in our food is wanting to induce decay in teeth it is the *rôle* of our physiologists to tell us; for dentists seem taken up too much with patching up the effects of decay to deal with the matter scientifically and to help us to apply preventive measures for this serious calamity of our generation.

THE reprint of Dr. Castellani's methods of preparing and administering anti-typhoid vaccine is more than justified; for those of us who have been giving anti-typhoid vaccine to young men and women proceeding from Britain to the Tropics have been disappointed to hear at a subsequent date that those who have been considered sufficiently protected against the disease have been attacked by typhoid with more or less severity. Young men proceeding to India to take up appointments in the Indian Civil Service are all "protected" nowadays against typhoid, yet it not infrequently occurs that these men are attacked by a "four-week fever" within, say, one to six months of their arrival in India. They are popularly considered to have suffered from an "initial" or "baptismal" fever." It is not *popularly* regarded as either typhoid or malaria, the symptoms being irregular, and the febrile attack takes a course characteristic of neither disease. One is free to surmise, although there is no definite proof to hand, that it is a modified typhoid or paratyphoid that produces the "initial" fever referred to, and such being the case, the explanation given by Dr. Castellani may be the correct one. The question, moreover, of local strains of the bacilli comes to the front in the matter, although scientific pronouncements for the moment are against it. In a recent issue of this Journal the question of local strain was referred to, and mention was made of the fact that men who had had typhoid fever in England did within twelve months of their going to South Africa during the war contract the disease there, indicating that a recent attack of typical typhoid did not afford protection against the South African strain. The question cannot rest where it is, and we would welcome reports from medical men in different parts of the world as to their experiences of typhoid or "typhoid-like" infection amongst the young men or women who have been inoculated by true typhoid vaccine or with a mixed typhoid and paratyphoid vaccine before leaving British shores.

Reprint.

TYPHOID-PARATYPHOID VACCINATION WITH MIXED VACCINES.

By ALDO CASTELLANI, M.D.

Director Government Clinic for Tropical Diseases, Colombo (Ceylon).

CONSIDERING the fairly frequent occurrences of paratyphoid A and paratyphoid B in tropical regions—at least in Ceylon and India—I have since several years advocated the use of a mixed vaccine—viz.: Typhoid + paratyphoid A + paratyphoid B—instead of the usual simple typhoid vaccine. Notes on the subject of mixed vaccines may be found in my old publications in the *Centr. für Bakteriologie* (1909), in the *Transactions of the Bombay Medical Congress* (1909), in the *Ceylon Medical Reports*, and in various recent communications.

My belief in the possibility of an efficient mixed vaccine being produced was based on the experiments I carried out in Bonn, while working under Professor Kruse, during the years 1901 and 1902. I demonstrated then (see *Zeit. für Hygiene*, 1902) that by inoculating an animal with two different bacteria at the same time, the blood produced agglutinins and immune bodies for both, and that provided a sufficient minimum quantity had been inoculated, the amount of agglutinins and immune bodies for each germ was about the same as in the animals inoculated with one germ only. I demonstrated that even inoculating a rabbit with three different micro-organisms (*B. typhosus* B + pseudo-dysentericus No. 1 (Kruse) + strain of *B. coli communis*, the amount of agglutinins and protective bodies elaborated for each germ was nearly the same as in animals respectively inoculated with one germ only. During the course of these experiments I was able to confirm that when the immunization is obtained by a single inoculation, provided the minimum dose sufficient to obtain the maximum immunization be given, the amount of agglutinins and immune bodies elaborated by the inoculated animals is not in proportion to the amount of cultures injected. A series of rabbits inoculated with 2 c.c. of typhoid culture will give the same average agglutination limit and the same amount of immune bodies as a series of rabbits inoculated with 4 c.c.

Since 1905 I have experimented with several mixed vaccines in man, of which the principal ones are a typhoid + paratyphoid A + paratyphoid B vaccine; and a typhoid + dysentery (Kruse-Shiga) + dysentery Flexner vaccine. I will limit my remarks to the typhoid paratyphoid B vaccine; but I may be allowed to note that anyone wishing to experiment with mixed dysentery vaccines should be careful always to use pepton-water cultures, as broth cultures of dysentery give rise to an extremely painful infiltration at the point of inoculation.

Method of Preparation of the Mixed Typhoid Paratyphoid Vaccine.

The mixed vaccines as prepared by me are either dead vaccines, the cultures being killed in the usual way by heating at 53° C., or live attenuated vaccines, by heating the cultures at 50° C. for an hour. During recent years I have used rather extensively both the dead mixed vaccine and the live attenuated one.

At first I used to prepare the vaccine as follows: Several tubes containing 10 c.c. of broth each were inoculated with two loopfuls of an agar culture of typhoid forty-eight hours old; other tubes with two loopfuls of paratyphoid B, and others with two loopfuls of paratyphoid A. All the strains I used were non-virulent, but rich in antigen, as shown by animal experiments. The inoculated tubes were kept for twenty-four hours in the incubator at 35° C. These cultures were then heated in a water bath at 55° C. (dead vaccine), or 50° C. (live attenuated vaccine) for an hour; they were then mixed together in certain proportions in sterile Petri dishes—two tubes (20 c.c.) of typhoid, one tube (10 c.c.) of paratyphoid B and one tube (10 c.c.) of paratyphoid A. The mixed vaccine consisted then of two parts typhoid, one part paratyphoid A, and one part paratyphoid B. I used to give 10 minims of the mixed vaccine at the first inoculation, and 20 or more at the second and third. At the present time the vaccine is standardized by counting the germs before mixing.

The mixed vaccine I use at the present time contains per cubic centigramme 500 millions typhoid, 250 millions paratyphoid B, and 250 millions paratyphoid A, and is prepared either from broth cultures or emulsions in physiological salt solutions; a little lysol is added (0·2 per cent.).

Dose and Method of Vaccination.—As already stated, the mixed vaccine I now use contains per cubic centigramme 500 millions typhoid, 250 millions paratyphoid A, and 250 millions paratyphoid B. I give 0·6 c.c. the first time, and double the dose a week later, and whenever possible a third dose two weeks from the first. In some cases, however, I give only ½ c.c. the first time, and 1 c.c. the second. Whenever possible I give a third inoculation two weeks after the first—the dose being the same as for the second. Very thin delicate individuals and young women receive a little less. Children between 8 and 15 get ¼ to ½ the adult dose. The inoculation of the mixed vaccine is followed by a local and general reaction which, as a rule, is not distinctly severer than after the inoculation of simple typhoid vaccine. Three or four hours after inoculation the region on the arm where the injection has been made becomes painful and red, and fever may supervene, which, as a rule, does not last longer than twenty-four to thirty-six hours, and does not in most cases incapacitate one for work.

As I do not believe that the immunization given by bacterial inoculation lasts, in man, very long, I generally advise people to be vaccinated once every two years, or even once a year.

Innocuity of the Mixed Typhoid-paratyphoid Vaccine.

The mixed vaccine, whether the dead one or the attenuated live one, is innocuous, as proved by several thousand inoculations done to date in Ceylon. Professor Browning, the Director of the Ceylon Government Chemical Institute, has to date received thirty-five inoculations of mixed live vaccine at one or two weeks' intervals, in addition to twenty-nine inoculations of simple typhoid live vaccine. He has always remained in very good health.

Remarks on the Immunization obtained in Man by the Mixed Vaccine.

Lack of time has prevented me studying the amount of all protective substances produced in inoculated individuals. The investigation, therefore, has been limited to studying comparatively the amount of agglutinins produced in some individuals inoculated with mixed and simple vaccines.

Two natives, David and Fernando, were inoculated with mixed (dead) vaccine, 0·6 c.c. the first time, 1·2 c.c. after a week.

One native, Peter, was inoculated with simple typhoid vaccine (dead) 0·6 c.c. the first time, 1·2 c.c. after a week.

One native, Baba Singho, was inoculated with simple paratyphoid A vaccine (dead), 0·6 c.c. the first time, 1·2 c.c. after a week.

One native, Asson, was inoculated with simple paratyphoid B vaccine, 0·6 c.c. the first time, 1·2 c.c after a week.

Two natives, A. E. de Silva and D. Gunesekera, were inoculated with 0·6 c.c. mixed *live* (attenuated) vaccine, and with 1·2 c.c. after a week.

One native, Isaac, was inoculated with 0·6 c.c. live (attenuated) typhoid vaccine, and with 1·2 c.c. after a week.

One native, Wellan, was inoculated with 0·6 c.c. live (attenuated) paratyphoid A vaccine, and with 1·2 c.c. after a week.

One native, Karuppen, was inoculated with 0·6 c.c. live (attenuated) paratyphoid B vaccine, and with 1·2 c.c. after a week.

All the inoculated persons were healthy young natives who volunteered for the experiment. They were inoculated on the same days, first inoculation taking place on June 14, 1913, and the second on the 21st of the same month. The blood of all the inoculated persons was investigated for presence of agglutinins regularly once a week, and the results

are collected in the following table, for the compilation of which I am indebted to Mr. Burgess.

From the table it will be seen that agglutinins seldom appear before the seventh day, and that the individuals inoculated with a mixed typhoid paratyphoid A paratyphoid B vaccine, produced agglutinins for all three germs, and that on the average the amount of agglutinins produced for each germ was not much smaller than in individuals inoculated with one germ only, although the latter had a much larger dose of the germ. As regards the length of time during which agglutinins were present in the inoculated individuals, the results did not differ much; if anything they were rather in favour of the mixed vaccines. Although of course one cannot gauge the actual immunization obtained, by simply studying the agglutination, there can be no doubt that to a certain extent agglutination is a rough index for immunization. It seems to me that these results are decidedly in favour of the advisability of using a mixed typhoid paratyphoid A paratyphoid B vaccine, in countries where all three diseases are met with.

Conclusions.—(1) The use of the mixed typhoid

LIMITS OF AGGLUTINATION.

Name	Vaccine used for inoculation		*B. typhosus* — Weeks after first inoculation											
			1	2	3	4	5	6	7	8	9	11	13	15
David	Mixed	"Dead"	0	1/100	1/200	1/200	1/300	1/...	1/...	1/80	1/60	1/40	1/20	1/20
Fernando	,,	,,	0	1/300	1/200	1/200	1/300	1/300	1/100	1/80	1/60	1/40	1/20	1/20
Peter	Typhoid	,,	1/20	1/300	1/300	1/200	1/300	1/150	1/150	1/150	1/150	1/60	1/20	0
Singho	Paratyphoid A	,,	0	0	0	0	0	0	0	0	0	0	0	0
Asson	,, B	,,	0	0	0	0	0	0	0	0	0	0	0	0
A. E. de Silva	Mixed	"Live"	1/20	1/300	1/300	1/200	1/200	1/100	1/100	1/80	1/60	1/20	1/20	0
D. C. P. Gunesekera	,,	,,	0	1/300	1/300	1/200	1/200	1/100	—	—	—	—	1/60	1/20
Isaac	Typhoid	,,	0	1/400	1/300	1/300	1/300	1/300	1/300	1/200	1/200	1/300	1/100	1/80
Wellan	Paratyphoid A	,,	0	0	0	0	0	0	0	0	0	0	0	0
Karuppen	,, B	,,	0	0	0	0	0	0	0	0	0	0	0	—
			B. paratyphosus A.											
David	Mixed	"Dead"	0	1/80	1/60	1/60	1/100	1/60	1/80	1/60	1/60	1/60	1/20	1/20
Fernando	,,	,,	0	1/60	1/60	1/40	1/60	1/60	1/80	1/80	1/80	1/40	1/20	1/20
Peter	Typhoid	,,	0	0	0	0	0	0	0	0	0	0	0	0
Singho	Paratyphoid A	,,	1/20	1/60	1/60	1/40	1/60	1/60	1/60	1/60	1/40	1/40	1/20	0
Asson	,, B	,,	0	0	0	0	0	0	0	0	0	0	0	0
A. E. de Silva	Mixed	"Live"	0	1/40	1/40	1/20	1/40	1/20	1/20	1/20	1/20	1/20	0	0
D. C. P. Gunesekera	,,	,,	0	1/60	1/40	1/40	1/40	1/40	—	—	—	—	1/40	1/20
Isaac	Typhoid	,,	0	0	0	0	0	0	0	0	0	0	0	0
Wellan	Paratyphoid A	,,	0	1/100	1/80	1/60	1/60	1/80	1/80	1/60	1/60	1/60	1/60	1/60
Karuppen	,, B	,,	0	0	0	0	0	0	0	0	0	0	0	—
			B. paratyphosus B.											
David	Mixed	"Dead"	0	1/20	1/40	1/20	1/60	1/20	1/20	1/20	1/20	1/20	1/20	1/20
Fernando	,,	,,	0	1/40	1/60	1/60	1/60	1/80	1/40	1/40	1/40	1/20	1/20	1/20
Peter	Typhoid	,,	0	0	0	0	0	0	0	0	0	0	0	0
Singho	Paratyphoid A	,,	0	0	0	0	0	0	0	0	0	0	0	0
Asson	,, B	,,	0	1/80	1/60	1/60	1/80	1/60	1/20	1/20	1/20	1/20	0	1/20
A. E. de Silva	Mixed	"Live"	0	1/40	1/60	1/20	1/40	1/20	0	0	0	0	0	0
D. C. P. Gunesekera	,,	,,	0	1/20	1/60	1/60	1/60	1/20	—	—	—	—	1/40	1/20
Isaac	Typhoid	,,	0	0	0	0	0	0	0	0	0	0	0	0
Wellan	Paratyphoid A	,,	0	0	0	0	0	0	0	0	0	0	0	0
Karuppen	,, B	,,	0	1/20	1/80	1/80	1/60	1/20	1/20	1/20	0	0	0	—

+ paratyphoid A + paratyphoid B vaccine, either the dead or the live (attenuated) one, is harmless. As there is such a general objection to the use of live vaccines I now recommend for routine use the mixed dead vaccine, which consists of an emulsion of typhoid and paratyphoid A and B bacilli, killed by heat (53° C.) in the usual way and standardized, so that 1 c.c. contains approximately 500 millions typhoid bacilli and 250 millions each of paratyphoid A and B.

(2) The inoculation of such vaccine in human beings in the doses mentioned in this paper, viz.: 0·6 c.c., or about 10 minims, the first time, and 1·2 c.c., or about 20 minims, the second—induces a production of agglutinins for all three germs: *Bacillus typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B. The amount of agglutinins elaborated for each germ seems to be practically the same as in individuals respectively inoculated with typhoid vaccine only, paratyphoid B vaccine only, paratyphoid A vaccine only.

(3) In countries where besides typhoid there occur paratyphoid A and paratyphoid B, a mixed vaccine should, in my opinion, be used, instead of the simple typhoid vaccine. This has been done in Ceylon for the last five years, with good results.

I desire to express my indebtedness to Mr. Burgess, Assistant Bacteriologist, for the very valuable assistance rendered.

REFERENCES TO PREVIOUS PAPERS ON MIXED VACCINES.

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Abstracts.

ABSTRACT OF PAPER ON ACCLIMATIZATION IN THE TROPICS.*

By Dr. TCHUDNOWSKY.

I DO not presume to wish to decide in the limits of a paper this vast and complex question of acclimatization. I only hope to be able to deal with certain elements of the matter, to analyse the ideas accepted at the present day, and contrast them with the results of my personal observations, based on a medical practice of twenty-one years in these parts.

CLIMATE.

To determine the quality of the climate in a given tropical region, we must know not only the meteorological facts, but also the degree of permeability of its subsoil and the forests which cover it, and which protect the soil from the direct rays of the sun. It would be more scientific to say climate is the sum of the meteorological, geological, topographical and social elements of a given region. The angle at which the rays of the sun fall enable us to divide the surface of the earth into three zones, but we shall only occupy ourselves with the acclimatization of the man proceeding from the temperate zone to tropical regions.

ACCLIMATIZATION.

Acclimatization is the innate faculty of every organized being, thanks to his nervous system, of being able to adapt his life to the changed condition of climate different from that in which he lived previously. The displacement of a man from one place to another in the same isothermic band says nothing for the character of his acclimatization. Thus a Parisian who moves from the central parts to the suburbs may during the first years be affected by the change; the children especially may become more liable to febrile disturbance, sore throats, eruptive fevers, &c. This is due probably to the unhealthiness of certain parts, caused by the ground being of a clay subsoil, and being in the neighbourhood of watercourses infected more or less during certain seasons; whereas the same man, moving from Paris to the Reunion or to Martinique into another isothermic band, was in no degree affected by these illnesses.

In like manner I may refer to the interesting report of A. Moreau de Journy to the Institute of France in 1817 that the Caraibes and the colonists of St. Vincent and Martinique who fled there in 1793 and 1796, the first to Guatemala and the second to Saint Dominique, almost all perished by a fatal epidemic, although their new habitation was only seven leagues from their homes, and there was no sensible difference in the soil or the water or vegetation of these two volcanic islands.

Let us now consider this question: Whether it is possible for the man of the temperate zone to acclimatize himself in the tropical?

The history of acclimatization of the last centuries, gathered from the voyages of Columbus and the celebrated Portuguese, Spanish, Dutch, and English captains in the East and West Indies, gives no scientific basis for a direct reply to the question.

The purely economic and religious struggle carried on by them against the natives excluded all possibilities of acclimatization.

The positive facts of the success of the acclimatization of the French in the " Ile de Bourbon," the English in the Barbados, the Spanish and Portuguese in Cuba and the high tablelands of Central America, and the Dutch in Guiana, are of little value by reason of their small numbers and by an enormous series of negative facts, which appear to prove that the tropical zone is fatal for the temperate zone men. It followed that the history of colonial wars and the colonization in the regions created conceptions against the possibility of this acclimatization. We will divide the arguments into physiological and pathological.

(1) *Physiological.*—The arguments are based on the pernicious influence of temperature on the

* Translated from a Paper read at the International Medical Congress (Tropical Section), August, 1913.

functions of the brain and skin of the white man, the result of absorption by the thermic and sudorific centres. There follows an irritation of the central nervous system, a diminution of energy, and this leads in two or three generations by slow degrees to degeneration in mind and body.

(2) The pathological arguments are based on the fact of the predominance in the tropical zone of fatal diseases, fatal for the white man, as paludism in all its pernicious forms: cholera, dysentery, beriberi, yellow fever, not to speak of the fatal diseases peculiar to the soil. On the other hand, the white man may die of tropical anæmia.

Let us consider these arguments from the *post-mortem* accounts at our disposal.

The first are based on the difference in the pigmentation of the skin and the volume of sebaceous glands in the negroes, although the skin apparatus is in general the same in men of all colours, yet these slight differences may account for the difference between white and coloured in the matter of sunstroke, tropical meningitis, &c.

The difference ought to be, as Dr. Eychmann has said, one of "Neurogenes art," and is the effect of the accommodation of the nervous system of the native. Measurements of temperature in the white man in a sound state have never been able to prove the fact of the accumulation of heat. Is this accumulation proved by the facts of insolation, or so-called sunstroke, or tropical meningitis? I cannot reply directly, but I may say I have never seen the tangible proof of this assertion. I must say that during twelve years' experience in the two hemispheres of the tropical zone, among soldiers, planters, sailors, and labourers I have never observed a single case of insolation or sunstroke. Sudden or slow death is always explained sufficiently by a sharp illness, and the high temperature is only an accident before death due to one of the causes enumerated.

As to the absorption of colour by the brown, yellow, or black pigment, I do not think this is of much importance, as the following fact will show. In the region of Pajacombo, on the west coast of Sumatra, I have seen native Malay women, not accessible to contact with Europeans, as white in skin as women of North Europe or America. The Equator passes through this region; that is to say, the sun's rays are very strong; yet this is considered the cradle of the Malayan race. One must add that it is the woman who works in the fields and is directly exposed to the sun's rays. Thus one may have a white skin and belong to an ancient race of the torrid zone.

Can one say that the high temperature causes the intellectual degeneration. I dare to say that facts prove the contrary, if the manners or *moral* of a race are the expression of its superior brain power. The intellectual and moral level of the Javanese is superior to certain peoples of Europe, as also are the Hindoos and even the negroes considered as a whole population.

The present generation of creoles in the Ile de Bourbon, whose ancestors settled there in the sixteenth century, have a decided leaning towards literature, and the country has produced a great number of lawyers and professors. This applies also to the creoles of the Antilles and Central America. The cradle of the philosophies and religions was in the tropical parts of Central Asia. The degeneration of the white man in the tropical zone is a theoretic supposition, based in no degree upon positive facts. On the contrary, the history of humanity teaches us that the warm rays elevate and refine the brain power of man. If the white man does degenerate, it is due to cerebral atrophy, due exclusively to the inaction and to the want of exercising the brain.

Dr. Tschudnowsky, in his paper, proceeds to enumerate several examples of serious epidemics occurring on plantations where coolies died in numbers, and where soldiers from Holland, shortly after landing in the Dutch Indies, were well-nigh exterminated. He shows that this was due to mental and moral depression, bad housing, bad food, detrimental environment, and to diseases such as malaria, beriberi, and dysentery, and not to climate *per se*. On the other hand he shows how planters of Deli in Sumatra, from all parts of Europe, gain their living in a flat, alluvial but drained and cultivated region during many years, and they are quite acclimatized and prosperous. They live a life in harmony with the exigencies of tropical countries; that is, a life of physical activity under burning rays in the fields. This normal way of living cannot but offer a barrier to fevers and would indicate that the climate was suitable for Europeans.

It is clear, then, that in relying only on older medical statistical figures, or those of explorers, arbitrary conclusions are arrived at without great value from a scientific point of view.

It is an admitted fact that the germs of tropical diseases are transmitted in the same way, with a few exceptions, all over the world. It follows, therefore, that the high temperature and humidity of the tropical zone will tend to the quicker development especially of those germs of the zoophytic and protozoan kind, and consequently to a more rapid course in the human organism.

The impermeability of the subsoil and the alluvial regions especially produce bogs and marshes, the luxuriant vegetation in virgin forests, and the sun's rays cause a pestilential air and miasmatic exhalations (which are not the exclusive lot of the tropical zone) characteristic of many unhealthy regions. I only mention here the paludism which forms the chief base of our tropical pathology. The physical character of the malaria parasite is not yet known, but it would seem certain it settles in these regions and develops there. The impermeable subsoil and the virginal forest form the natural laboratories for the growth of these protozoans and they infect man by direct inoculation following on the bite of anophelines.

Dr. Tschudnowsky then proceeds to state his conviction that malaria is conveyed by other means than by mosquito bites. He cites examples of serious outbreaks of malaria in regions where

anophelines are few and where the "miasma" alone can be the infective power. He believes in the existence of the malaria parasite in the swamps and forests and accounts for sudden epidemics by these parasites being carried in the air by winds, independently of mosquito bites altogether. He then proceeds to show how the sun's rays serve to protect unhygienic regions and cities from prevalent maladies and states that the high temperature and the direct sun's rays do not provoke a tropical malady. On the contrary, they kill the pathological germs, as in the following instances:—

At Canton, in China, a town of about a million inhabitants, with a large population dwelling in boat-houses, all the filth and the corpses of animals are thrown into the streets, as in many Chinese central towns, and nevertheless epidemic diseases are rare. The same thing happens in Curaçao and in most of the Central American towns. In Curaçao the inhabitants throw all the organic and culinary waste into the canals or the streams before their houses.

In many parts, as the islands in the Indian Ocean, Mauritius, Ceylon, and other tropical places, there is no fear of epidemics, the germs do not live. This is because the forests where the germs thrive have been destroyed or cultivated by man. It then follows that the base of the arguments proving the impossibility of acclimatization are scientifically wrong in their practical application.

Conclusions.—Doctors Cazalis and Carry wrote in the *Moniteur Algérien* in 1854 that they were convinced of the possibility of the acclimatization of the white man in all the warm countries. This fervid conviction, which ought to have been destroyed by the sad results of the first expeditions and trials at colonization in North Africa, became a true reality in our days.

The acclimatization of the man of the temperate zone in the Tropics is therefore possible theoretically and practically.

I will formulate as a conclusion in the following rules on which depend the perfect success of this acclimatization:—

(1) Systematic and methodical culture of the soil of the neighbouring forests, especially those in the direction of the trade winds.

(2) Methodical physical exercises in the open air as in the temperate zone.

(3) Methodical and systematic intellectual exercises as in the temperate zone.

ULCUS MOLLE SERPIGINOSUM.*

By J. E. R. McDonagh, F.R.C.S.

The primary lesion is a furuncle, the edges of which become blue, bluish-white, and then break down until a distinct ulcer is formed.

The base of the ulcer is fleshy, uneven, and secretes freely. The edges are ragged, look as if they had been gnawed, and are deeply undermined; the overhanging portion is œdematous and bluish-white in colour; external to this the colour becomes purplish, and still further out, and spreading for some distance into the healthy tissue, one sees the red colour of inflammation. The inflammatory zone is most marked where the ulcer is spreading, as it invariably spreads in one part more than another; in fact, one pole may heal while the other is steadily advancing. A very favourite route for one tongue of the ulcer to take is down the genito-crural fold. Occasionally such a process reaches as far back as the anus.

Case 1.—A man, aged 25, had been four years in the East and only really ill with malaria during the first year. Ten years ago he had albuminuria following typhoid fever.

The only drug which seemed to do the least good was potassium iodide given internally. When the salt was pushed up to 200 gr. *per diem* and the sores washed with perhydrol and then dusted with iodoform, the ulcers, after several weeks, completely healed.

Several films and cultures were made with negative results; these were again repeated when the ulcers secreted more freely, and every time a pure culture of *proteus* resulted.

Vaccines made therefrom stopped the discharge and removed the fearful odour it gave rise to, without in any way causing the ulcers to heal. The *proteus* was *Proteus vulgaris;* it was Gram-negative, very motile, and the bacilli varied in length. It gave acid and gas in glucose and lactose and clotted peptonized milk. It rapidly liquefied gelatine. A rabbit which was injected died in forty-eight hours from acute septicæmia.

Pieces of tissue were removed and injected into a rabbit, a guinea-pig and a mouse intravenously, intraperitoneally, and subcutaneously respectively. Only the mouse died a fortnight later, and in spite of a thorough examination of all its organs nothing abnormal was discovered.

The bloods of the rabbit and guinea-pig were tested from time to time with negative results.

In the most superficial layer of the undermined portion strepto-bacilli were to be found. The bacilli were Gram-negative, usually in pairs, and never in chains of more than five or six. No intracellular organisms were to be found.

Several attempts were made to culture the organism on both rabbit's and human blood-agar, but failed.

Case 2.—A man, aged 27, who had spent several years in the Malay States. In both groins were several ulcers; they were extending above on to the abdomen and below on to the thighs, and on both sides they had reached far down in the genito-crural folds. The ulceration began seven months before.

Five years before he had had some sores on the penis (ulcera mollia), which healed up without any complications arising therefrom, such as bubo, &c. In November the patient fell over a log of wood, with the result that two days later a swelling appeared in the skin in the inguino-scrotal folds on

* *The British Journal of Dermatology*, January, 1914.

both sides. The swellings behaved like boils, so were lanced, and from that time onwards they became ulcers, which rapidly tended to increase in size. As no local application was of any use, the patient was put under an anæsthetic, and the ulcers were well scraped, with the result that they spread quicker than ever.

When first seen the patient could not walk owing to the pain caused by the ulcers; the ulcers discharged freely, and had that peculiar indescribable odour noticed in every case seen.

Films from secretions from under the overhanging portion of skin in the region where an ulcer was spreading showed Ducrey's bacillus. Separate streptobacilli were to be seen, also many in pairs and some in chains, but contrary to what one finds in ordinary soft sores many of the leucocytes were crammed with a different form of Ducrey's bacillus. To prove that the ulcers were due to Ducrey's bacillus the patient's arm was inoculated, and after the usual incubation period, a typical soft sore formed from the same bacillus was isolated.

Treatment consisted in gradually increasing doses of iodides until the patient took 200 gr. per diem; the maximum was maintained for one week and then gradually decreased, and so on until the ulcers had completely healed, which they took three and a half months to do.

Locally the ulcers were painted with camphphenol and then dusted with iodoform.

Case 3.—A man, aged 32, who had spent the last few years in Ceylon, had an ulceration in his groin and upper part of the thigh. The ulceration started in the groin as a little furuncle three years after he had had some sores on his penis (ulcera mollia). He had never had a bubo. The furuncle became an ulcer which spread down over the thigh, so that when seen practically the anterior surface of the upper half was one huge ulcer, although the superior part had commenced to heal. The ulcer had persisted for two and a half years, and in spite of having had every kind of treatment imaginable, nothing did any good. From this ulcer the intracellular form of Ducrey's bacillus was found. The treatment consisted in iodides internally, camphphenol and iodoform externally, and in addition the patient had five intravenous injections of tartar emetic every four days, 0·1 grm. in 100 c.c. saline, with the result that in three weeks the ulcer had completely healed.

Case 4.—A man, aged 36, a native of India, had an ulceration of both thighs almost down to the knees, and above the groin practically the whole of the lower third of the abdomen was involved. The ulceration had persisted for over five years, and had not responded to any treatment that had been given. Unfortunately this patient died before anything could be done.

Case 5.—A man, aged 34, who had spent some years in the tropical part of Australia, consulted me for a chronic ulceration of one groin. The patient had had a soft sore and a bubo resulting therefrom, which had to be incised. The soft sore healed rapidly, but the edges of the bubo became ulcerated until a typical picture of ulcus molle serpiginosum presented itself. This ulcer rapidly healed under potassium iodide internally, camphphenol and iodoform externally, and tartar emetic intravenously.

It is a peculiarly chronic form of ulceration which at varying periods invariably follows a soft sore appearing independently of a bubo or after a bubo has been incised. It is further characterized by the fact that in every case the patient had lived in the Tropics.

It is quite clear that any operative procedure makes matters very much worse, and that unless exactly the specific treatment is prescribed nothing is of any avail.

The best treatment appears to be to give potassium iodide internally, to apply camphphenol and iodoform externally, and healing can be hastened by giving injections of tartar emetic intravenously. Either the antimony acts specifically or its action is due to freeing the iodine, which has undoubtedly a specific action. This is suggested because, after every injection of antimony, the patients always had a violent fit of coughing, which lasted for about twenty minutes—a cough resembling that which might be produced by inhaling iodine.

A bubo should never be opened until the dire necessity arises, and even then only a nick with a bistoury should be made, not the 2 to 3-in. incision which is usually practised.

Nearly all the cases of ulcus molle serpiginosum have followed an operation on a bubo.

Bacteriology.—In describing Ducrey's bacillus one must bear in mind the extraordinary morphological differences which the organism may present. The following five types are those given by Tomasczewski ("Handbuch der Geschlechtskrankheiten," vol. ii, p. 631):—

(1) Short rods which are difficult to distinguish from cocci, being 0·4 micron long and 0·3-0·35 micron wide.

(2) Longer rods with rounded ends; the bacilli are usually isolated—length 1·5-1·7 microns, breadth 0·4 micron.

(3) Dumbbell forms, which are usually found in groups.

(4) Forms like diplococci, first described by Unna as the "Doppelpunkt bacillus" and by Ducrey as the "Achterform." Length 1·0-1·5 microns, breadth 0·3-0·4 micron.

(5) The "*en navette*" form of the French or the "Schiffchenformen" of the Germans, rods which have an unstained point in the centre; length 1·1-1·5 micron, breadth 0·5-0·6 micron.

The "*en navette*" type is rare in soft sores, but extremely common in ulcus molle serpiginosum; the short rods and diplococcal forms were also found, but they were always extracellular, while the "*en navette*" form, although found extracellularly, was most often and in enormous numbers found intracellularly situated.

Hitherto no attention has been paid to this intracellular habitat of Ducrey's bacillus, but it doubtless accounts for the chronicity of the lesions and

the way in which they resist anything but specific treatment.

In ulcus molle, Ducrey's bacillus is extracellular; in the complication ulcus molle serpiginosum, which is one of the most chronic ulcers known, the organisms have become intracellular.

The so-called *Granuloma venereum* or *Granuloma inguinale* is an allied condition to ulcus molle serpiginosum, and this opinion is backed up by Flu's description of intracellular diplococci which he found in the first-named condition. Flu says that in some cells there are diplococci which stain violet with Giemsa and have an unstained capsule. If strong Giemsa stain is used the capsule stains a bright red. Some of the organisms are bacilli, not diplococci; only a few are to be found extra-cellular. Flu cultured some of these and obtained plump bacilli which morphologically resembled Ducrey's bacillus, and they were, moreover, Gram-negative.

There must be some climatic circumstance which favours the intracellular habitat of Ducrey's bacillus.

Not infrequently the lymphangitis of the penis which follows a soft sore may become adherent to the skin and ulcerate, producing an even-cut, freely discharging ulcer, which heals very quickly under treatment. While the soft sore and bubo are still present the patient may develop on the scrotum, the thigh, or the abdomen one or more ulcers which differ in appearance only slightly from the ulcus molle serpiginosum. The edges are scarcely undermined, they have not the blue appearance of venous congestion, the surrounding inflammation is not so marked, and the base of the ulcer is not so deep. Such ulcers heal very rapidly under local applications of camphphenol and iodoform, and the Ducrey's bacillus is always found extracellularly situated.

Annotations.

A New Blood-sucking Midge.—Patton, writing in the *Indian Journal of Medical Research* (vol. i, No. 2, October, 1913), describes a new Indian blood-sucking midge. Professor Kieffer, to whom specimens were sent, stated that it was a new species of *Culicoides*. Patton has therefore named it *Culicoides kiefferi*.

The genus *Culicoides*, Latrielle, which belongs to the sub-family Ceratopogoninæ, contains a number of small midges, the females of which are, as a rule, voracious blood-suckers; in many parts of India and Africa they attack man and animals in swarms and are great pests. The majority do not measure more than 1 mm. in length and are nearly always of a dark brown colour, sometimes yellowish, rarely whitish. They may be distinguished from the species of *Ceratopogon*, another group of small midges to which they bear a superficial resemblance, by the rudimentary nature of the empodium, which in the latter genus is well developed and as long as the claws.

As far as is known at present, no species of *Culicoides* is even suspected of being the invertebrate host of any pathogenic parasite, and as they are difficult to study, due chiefly to their small size, very little is known regarding their habits and life-histories.

The eggs of the new species are extremely minute objects and are laid in a mass in the vicinity of water, usually on some green algal growth which collects at the edges of small pools and where water trickles over the ground. The larva will be found buried in the green algal matter and may be recognized by its slender body and its rapid vibratile movements, which closely simulate those of a giant spirochæte. It consists of twelve segments (including the head), all of which are smooth and almost entirely devoid of hairs. Unlike the larvæ of all the other known species of Chironomidæ, that of *Culicoides* has no pseudopods on the ventral surface of the first thoracic segment. The head is well developed, and the eyes are kidney-shaped; the dorsal surface and sides are furnished with several small hairs, the two most prominent being situated on the mid-frontal region. The antenna consists of a single minute segment with a delicate hair at its apex. The mandibles are stout curved rods of chitin and are armed with two teeth. The last segment has four pairs of appendages which are deeply bidentate and can be extruded and withdrawn at will into the segment. These structures correspond to the tracheal gills of other aquatic larvæ; true stigmata are wanting.

The pupa is very characteristic. Its surface is almost entirely devoid of bristles, but it has well developed spines at the sides, and knob-like processes on the dorsal surfaces of the abdominal segments. There is a pair of long breathing trumpets arising from the sides of the mesothorax, the stalks of which are very narrow and armed with several minute blunt knobs; the trumpets end somewhat like those of culicid larvæ. There are in addition several protuberances with hairs and spines at their extremities, and minute processes on the thorax. The pupa, which never has the larval skin attached to it, anchors itself by two prominent terminal spines; or it may float on the surface. The flies hatch in three days.

The female shows the following characteristics. Head, palpi, and antennæ light brown. Thorax light brown with a median dark band extending from the anterior end to about the centre, where it divides into two short branches; in addition there are several dark spots and indistinct bands, particularly at the sides. Abdomen light brown with faint dark bands and spots. Legs brown with light bands at the middle of the femora most prominent on the hind legs; fore metatarsi equal in length to the three succeeding joints; empodium small and indistinct. Wing white, the surface clothed with fine hairs, and in parts with longer ones; a well-marked fringe borders the wing. There are two large dark brown spots, one about the centre of the costal border covering the entire third long vein; the other which is also on the costa is nearer the apex of the wing; there are in addition several lighter spots. The third longitudinal vein, which is

closely adjacent to the first, is very pale, and abuts on the costa about its centre. The fourth vein bifurcates about the centre of the wing and the fifth divides opposite to the extremity of the third vein. Length 1·5 mm.

The male is in most respects very similar to the female, but throughout it is lighter. Both sexes may be caught in large numbers on window panes in the laboratories of the King Institute, Madras. The females bite in the early morning and may then be caught in large numbers on the shaved abdomens of calves. The flies disappear about April when the hot weather begins, and reappear in November.

"*The Protection of India from Yellow Fever*" is the title of a Report by Major S. P. James, appearing in the October, 1913, number of the *Indian Journal of Medical Research*. The author commences by remarking that, "yellow fever has not yet appeared in India, but the abundant presence of the mosquito *Stegomyia fasciata*, which transmits it, the susceptibility of the population, and the general conditions in the chief seaports are very favourable to its existence and spread, and it is believed that the introduction of the virus would be followed by devastating epidemics which would be exceedingly difficult to control. In 1903 Sir Patrick Manson drew prominent attention to the risk that the commercial developments which will follow the opening of the Panama Canal may lead to the introduction of the disease into Asia, and in June, 1911, the danger was discussed in an important paper by Major E. F. Gordon Tucker, I.M.S., Professor of Pathology in the Grant Medical College, Bombay." Major James was deputed by the Indian Government in October, 1911, to ascertain the conditions in a portion of the endemic area in Central America, and in the principal seaports between that country and India. The present report is the outcome of this investigation.

The first ideas that come to one's mind on examining a map of the world or of the Pacific Ocean, prepared on Mercator's projection, are that the Panama Canal will provide a direct route to Asia and India from Europe, the United States and the endemic area of yellow fever, and that after the canal is open for traffic there will be a danger of yellow fever being conveyed to India by direct shipping to that country from or by way of ports in the endemic area on the Atlantic side of the canal. But charts on Mercator's projection give a distorted view of the features of the earth and a wrong impression of the shortest distances between most ports, so that in order to ascertain whether our first ideas are tenable, and to enable the problem with which India is concerned to be accurately stated, it will be convenient to begin the attempt to estimate the risk with a record of the actual distances between certain ports. In the report the distances are set forth in tabular form. It will be seen that:—

(1) The opening of the Panama Canal is not likely to be followed by direct traffic from Europe through the endemic area to India, for the distance between London and India is, on an average, 10,500 miles longer by the new route than by way of the Suez Canal. This is important, because most of India's seaborne trade is with Europe.

(2) It is not likely to be followed by direct traffic from the United States through the endemic area to India, for New York is, on an average, 6,800 miles, and New Orleans 3,200 miles nearer to India by way of the Suez Canal than by way of Panama.

(3) It is not likely to be followed by direct traffic from the endemic area *via* Panama to India, for much the shortest routes to that country from the West Indies, Mexico, the Central American Republics, the Panama Canal zone, Colombia, Venezuela and Guiana will still be by way of Suez, and from Brazil the shortest route is by way of the Cape of Good Hope. Major Tucker, in the paper already mentioned, suggests that Jamaica may be a place from which there will be direct traffic to India, but if this were to happen the route would surely be by way either of the Suez Canal or the Cape of Good Hope; the distance from Jamaica to Bombay by the Suez route is about 1,500 miles shorter than by way of the Panama Canal. In this connection it is noteworthy that the Republic of Panama already imports Burmese rice which goes by way of Liverpool or Hamburg to Colon.

(4) It is believed that the opening of the canal will result in a great increase of trade in the Pacific Coast ports of South America, and it might be conjectured that direct trade between those ports and India will follow. For many reasons this is very unlikely to happen, but even if there were direct trade between say, Peru or Chile and India, the best route would be from Callao and Valparaiso, *via* the Straits of Magellan and the Cape of Good Hope; for the distance from Valparaiso to Bombay by that route is nearly 4,000 miles shorter than by the trans-Pacific route.

Distances of course are not the only factors to be considered in attempting to foretell future trade routes; but in the present case the conclusions to which their study leads are supported by other considerations, and, on the whole, it seems clear that the spread of yellow fever to India, if such happens, will not be the result of direct trans-Pacific shipping to that country from, or through, the endemic area in Central or Southern America.

If the same line of inquiry is applied to ports farther East than India, it will be found that beyond Singapore the conclusions are, with one important exception, the reverse of those arrived at concerning India; in general the distances to Japan, China, Australia, and the East Indies will be much shorter by the new route than by the present ones, and for this reason direct traffic to those countries through and from the endemic area may be expected. The exception is with regard to the distances between Europe and the countries named above; it will be seen that for trade between Europe and these countries the Panama Canal will not provide a shorter route than the present one by way of the Suez Canal, and this is, of course, important as indicating that the through traffic *via* the endemic area to the East will not be so great as has sometimes been anti-

cipated. If we judge by the factor of distance alone, it is clear that the through traffic to the East by the new route will be confined to traffic from the United States, and even as regards that traffic it must be noted (*a*) that the Panama Canal route has to compete with the routes by way of the trans-continental railways of Canada and the United States, and the inter-oceanic railways of Mexico, Guatemala and Costa Rica; (*b*) that for the trade from New York to Hong Kong, the Panama Canal route will have to compete with the present one *via* the Suez Canal, for the gain in distance is not much more than 200 miles. Major Tucker suggests that the direct trade between England and Hong Kong will be greatly facilitated by the opening of the canal, but this view is not supported by the facts that the new route from London to Hong Kong will be about 4,400 miles longer than the present one *via* the Suez Canal, and will even be about 1,000 miles longer than the route *via* the Cape of Good Hope.

The author sums up the conclusions resulting from the inquiry by saying that the danger is a direct danger only as far as Hong Kong, and that the spread of yellow fever to the Straits Settlements and to India by the route which has been considered cannot result except as a secondary event subsequent upon the infection of ports in Japan, China, the East Indies, or Australia.

There is then given an account of the existing trans-Pacific steamship traffic of the New World, and it is shown that the chief conclusion to be drawn from it is that at present most of the traffic to the East starts from ports such as Vancouver and San Francisco, which are not now, and are not likely to be in the future, infected with yellow fever, but that there is also (and has been for some years) a moderate amount of traffic from ports, especially on the Mexican Coast, which at least must be regarded with suspicion.

As to the new problems that will arise when the Panama Canal is open for traffic, the author is by no means sure that the risk of the spread of yellow fever will be increased to the extent anticipated, for the situation on the Atlantic side of the canal, and in the canal zone itself, is very different from what it was in 1903, when Sir Patrick Manson first drew attention to the dangers now under consideration. Since that time measures have been taken which have gone far to cause the disappearance of yellow fever from places which were formerly severely affected. Panama, Colon, Havana and other Cuban ports, New Orleans, Rio de Janeiro, and nearly all the West Indian Islands are at present free from the disease, and as regards ports on the Atlantic side of the canal which are likely to be engaged in trans-Pacific trade, none are believed to be endemically affected at present. Further, every possible precaution has already been taken, and will doubtless be continued, to prevent the canal from being a route by which disease may spread, and it is very improbable that the United States will in future neglect their great responsibility in regard to this matter.

Ships leaving America for the trans-Pacific voyage to the East from San Francisco and more southerly ports, use the Hawaiian Islands as the first place of call. The conditions in these islands are throughout the year favourable to the existence of yellow fever, but up to the present the disease has been effectually excluded. The authorities fully appreciate the danger, and very thorough precautions are taken, so that the author thinks that the port affords a strong protection against the infection of Asia and the East Indies. On the usual route to Hong Kong the ships, after leaving Honolulu, pass northwards into latitudes, not as a rule, favourable to the life of mosquitoes, and the remaining ports of call are Yokohama and other Japanese ports, and Shanghai. The climate of Hong Kong is favourable to the existence of yellow fever, but no definite data as to the existence or not of *Stegomyia fasciata* there are forthcoming. The route from San Francisco *via* Honolulu to the Philippines does not necessarily take ships northward to Japan, but until San Francisco or Honolulu becomes infected such a route is not a cause of anxiety. On the whole, the author concludes that the present routes are not very favourable to the infection of Asia, and it only remains to foretell whether future routes will be more so.

Section II of the report is concerned with recommendations, for though the considerations summarized in the first part of the report lead to a modification of opinion regarding the degree of danger of spread of yellow fever to the East and India, it cannot be too strongly urged that they do not justify the conclusion that little or no activity is at present necessary.

(1) In the first place it is important to obtain continuous first-hand information regarding the yellow fever situation in the endemic area, the actual shipping traffic from and through that area to the East, and the measures that are taken to prevent ships from carrying the infection. This can be accomplished by appointing a medical officer in the Panama zone whose duty it would be to supply regularly such information. Supplementary to this measure it would be highly advisable to appoint a second medical officer with Hong Kong as a centre, and possibly a third whose headquarters would be at Singapore.

(2) In the second place it must be recognized that there is little or no knowledge, not only upon the subject of a sure method of diagnosing yellow fever, but upon such subjects as the presence or absence and distribution of *S. fasciata* in eastern colonial and other ports, the problem of whether the very widely distributed and abundant species *Stegomyia scutellaris* carries the disease or not, the bionomics of those species and many other matters of prime importance in connection with etiology and prevention; and that should occasion arise to deal with an irruption of yellow fever in a new territory, this want of knowledge would greatly hamper and delay efficient and enlightened action on the part of the authorities concerned. Therefore, the second recommendation is that the study of the subjects named, and of other subjects of which a complete knowledge is essential to a successful combat against the disease, be adequately taken up.

(3) If the above recommendations are accepted, India should take a prominent part in the matter by offering to give financial or other assistance towards the appointment of the intelligence officers, the establishment of the central Intelligence Bureau, and the institution of any scientific inquiry which may be carried out under the auspices of the Royal Society.

Also India must proceed with the systematic investigation of the Stegomyia problem, and in general with the carrying out of such measures as are of permanent value in reducing the breeding places of stegomyia mosquitoes, while the problem of the possible spread of yellow fever by way of the Cape of Good Hope calls for inquiry on the part of India.

(4) It is advisable to strengthen the line of sanitary defence for our eastern colonies, and for India especially, in Hong Kong and by the establishment without delay of a modern quarantine station adequate to the needs of a shipping centre of such importance, for it is not at present clear what steps could be taken if a ship infected with yellow fever were to arrive at that port.

In Section III the author gives a general description of the conditions in most of the ports visited by him, dealing with only such conditions as are of importance in connection with yellow fever.

The report is illustrated by a large map giving the shipping routes, several plans and tables of distances, and will be found of utmost interest to those concerned with the possible spread of yellow fever to the East.

The Keeping Properties of Condensed Milks in the Tropics.—Beveridge (*Journal R.A.M.C.*, January 1914), from a careful investigation of this important matter, comes to the following conclusions: The change in colour in certain kinds of condensed milks is presumably due to brown colour being developed by reducing sugars in solution at certain temperatures, and is likely to be more marked with an increase of acidity due to bacterial fermentation; the presence of iron in the ferric state also plays a part in the production. In sterile condensed milks, chiefly found among those brands that contain no added sugar, changes are not noticeable. Sterile uncondensed tinned milk shows no change after incubation at 37° C. for many months. The increase in acidity is brought about by bacterial activity resulting from the increased temperature, and hydrolysis of the sugar follows. The bacteria concerned in the change are spore-bearing bacilli, which produce an acid fermentation of the proteins. In milks containing only Gram-positive staphylococci a brown colour is not produced. It would seem that the depth of the brown colour is dependent on the amount of reducing sugar produced or of iron present, and is likely to be more intense in sweetened milks, owing to the reduction of the added cane-sugar. The increase in consistency noticed in connection with the brown coloration in sweetened milks is due also to bacillary fermentation, and some of the protein is consequently rendered insoluble. For service use in tropical climates there is no doubt that to obtain better value, and to obviate the risk of such a change occurring, especially when milks have to be stored for considerable periods, only those brands of unsweetened milk which have been proved to be sterile should be selected.

The Transmission of Pellagra from Man to Monkey.—W. H. Harris (*New Orleans Medical and Surgical Journal*, November, 1913) reports two experiments on monkeys, and in closing his recital of these says it would seem that pellagra may be transmitted to the monkey (*Macacus rhesus*) by means of a Berkefeld filtrate derived from the tissues of the human patient; at least, the animals develop all the essential clinical signs and symptoms, together with the pathological picture present in the disease in man. They further suggest that the etiological factor of pellagra may be a member of a large group of Berkefeld filter passers, such as fowl plague, vaccinia, foot-and-mouth disease, molluscum contagiosum, poliomyelitis, &c.

Pellagra (*Journ. Amer. Med. Assoc.*, January 17, 1914).—J. F. Siler, P. E. Garrison, and W. J. MacNeal conclude from their investigations that the supposition that the ingestion of good or spoiled maize is the essential cause of pellagra is not supported. Pellagra is in all probability a specific infectious disease communicable from person to person by means at present unknown. The authors have discovered no evidence incriminating flies of the genus *Simulium* in the causation of pellagra, except that these flies are universally distributed throughout the area studied. If pellagra is distributed by a blood-sucking insect, *Stomoxys calcitrans* would appear to be the most probable carrier. The authors are inclined to regard intimate association in the household and the contamination of food with the excretions of pellagrins as possible modes of distribution of the disease. No specific cause of pellagra has been recognized.

Notes and News.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

The Society of Tropical Medicine and Hygiene has now taken a room from the Medical Society of London at 11, Chandos Street, Cavendish Square, London, W., for its permanent quarters. Fellows will now, therefore, be able to use this room, from 10 a.m. to 5 p.m. daily, both for reading and for the examination of microscopical specimens. A certain number of exchange publications lie upon the table, and the late Dr. Carnegie Brown's bequest of books forms the nucleus of a small library. These works can also be consulted.

It is hoped that Fellows upon arriving home from abroad will make use of the room and also record their home addresses there. By so doing men from

different colonies will be able to come into touch with each other and so exchange ideas. Up to the present time the lack of such accommodation has been felt by many, and the Society hopes, now it has been able to get permanent quarters, that this want will be suitably met.

MEDICINE AND MEDICAL CUSTOMS IN EGYPT.

(1) *The Hearst Papyrus.*—The latest addition to our knowledge of medicine in ancient Egypt is contained in the " Hearst Papyrus " discovered by United States explorers working in Egypt. The period of its publication is presumed to date between the years 2400-1600 B.C. There is little in the text except prescriptions, but what these are for it is difficult to judge, for the diseases, as they are presented, are unrecognizable. There is a close resemblance between the " Hearst " writings and that contained in the " Ebers Papyrus." In fact, the Berlin, the Ebers and the Hearst papyri seem to have been a collection of prescriptions employed by doctors of the period mentioned and originating from some standard text.

(2) *Rectrictions concerning Circumcision under the Romans.*—Recently discovered papyri in Egypt throw fresh light upon circumcision and castration in that country, especially whilst it constituted a province of the Roman Empire. In the time of Hadrian the system of having a number of eunuchs in the households of the rich became so prevalent that there was a danger of a diminution of the population, and castration had to be prohibited by law, and especially enforced during the reign of the Emperor Antoninus.

Circumcision was also denounced by Hadrian, although the reason does not seem quite clear, except perhaps it was for political purposes, seeing that the Jewish population in Egypt practised the rite. The Jews, who gained to their ranks many Roman citizens, insisted that the converts to their religion and the slaves in their household should all be circumcised, and it was probably to prevent secession from the ranks of Roman citizens that the law was made. In the time of Antoninus the regulation was promulgated that although Romans might adopt the Jewish religion, it was illegal for the Jews to circumcise their converts or their non-Hebrew slaves. Jews and Egyptian priests were allowed to practise circumcision, but it was held to be a criminal act to circumcise the laity. The question, therefore, seems to have become not a hygienic, but a political measure of some importance.

These matters are dealt with in a paper by Joseph Orford, published in the *Proceedings of the Royal Society of Medicine*, April, 1913.

BENGAL MEDICAL BILL.

THE European Defence Association has addressed the Bengal Government on the provisions of the Bengal Medical Bill, 1913, and while approving of it so far as it goes, regrets that its provisions are not more drastic and comprehensive. Complaint is made that the Bill in no way deals with the question of persons practising the European system of medicine and advertising themselves as holders of degrees and diplomas which are unrecognized by the Medical Council of Great Britain. The Association suggests in default of legislation to prevent this practice, such persons should be deprived of power to recover charges for services by legal proceedings in courts.—*The Homeward Mail.*

SCARCITY OF EUROPEAN MEDICAL OFFICERS IN BURMA.

The Homeward Mail of December '27 says: The Burma Chamber of Commerce in a long letter call the attention of the local Government to the inadequate provision of European medical officers in the province, which is aggravated by the medical policy laid down in the Secretary of State's despatch dated December, 1908. In other Indian provinces with an organized European medical service, the practice of Western medicine has been encouraged where there is no material for the recruitment for a native independent medical service. As examples of the Government's medical policy the Chamber point to the refusal to supply Indian Medical Service officers to growing trades centres, the understaffing of the Rangoon General Hospital. and the slow development of the Burma Medical School. It is contended that by the refusal to meet the need for medical aid in rapidly growing commercial towns, many valuable lives have been lost and commerce has been checked. The policy of repression of the Indian Medical Service is detrimental to the commercial progress of this young province. The Chamber heartily acquiesce in the views of the European Defence Association in their representation to the Government of India on medical attendance for Europeans, especially women and children in out-stations. Finally, Burma, it is urged, has no confidence in medical assistance except that dispensed by Europeans or Burmans. The local Government replied and sympathized with the view that it was desirable to post Indian Medical Service officers as civil surgeons in the Dumber districts, but say that they have not now any available. The need for more such officers in Burma has often been represented to the Government of India, whose orders are still awaited. The Chamber's letter on the subject will be forwarded to the Government of India.

We have been requested by Messrs. Butterworth & Co. (India), Ltd., Medical Publishers and Booksellers, to state that they have been appointed sole agents in India for all the medical and surgical works of Messrs. John Bale, Sons & Danielsson, Ltd. As the latter firm are so well known for their numerous publications dealing particularly with the diseasss of tropical and sub-tropical climates, and are also publishers of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, we would advise those seeking information as to the latest editions of such works to write Messrs. Butterworth at 6, Hastings Street, Calcutta, for a copy of their catalogue.

Memoranda.

Drug Rashes.

Antipyrin causes round or oval erythematous patches, succeeded by pigmented areas if the drug is withheld.

Alkaline bromides and iodides induce acne; the points may fuse and a lesion resembling a carbuncle results.

Arsenic at times brings out a brown pigmentation of limbs when its exhibition is protracted.

Antimony, aconite, belladonna, iron, morphia, phenacetin, quinine, salicylates, sulphonal, usually cause an erythematous rash or urticarial patches.

Sleeping Sickness in Principe Island and Angola, West Africa.

In the Portuguese Island of Principe (marked in most British maps as Prince's Island), Surgeon McCowen, R.N., found in 1911 that sleeping sickness prevailed to an alarming extent. The island is in the Gulf of Guinea, some 120 miles off the African coast and south of the Spanish island of Fernando Po. More than half the deaths in the island are due to sleeping sickness. *Glossina palpalis* is the prevalent glossina, but *G. palpalis wellmani* (Austen) and *G. medicorum* (Austen) have also been found in Principe and Angola. It is interesting to note that the natives quite appreciate the connection between the bite of the tsetse-fly and trypanosomiasis; the houses of the more intelligent natives in Principe have finely meshed wire gauze over their windows and doorways, and do not venture out for pleasure until dark, when the fly becomes inactive The tsetse-fly especially attacks the back of the neck and the natives have a habit of continually passing their hands over this part when walking out of doors. There are plenty of wild animals in the small island to act as alternative hosts for the tsetse-fly, and Dr. Mendes, of Angola, recommends as a mode of freeing the island from the disease, that all wild animals should be killed and all the natives and Europeans should leave the island for twelve months, by the end of which time trypanosomiasis would probably be exterminated. This is a rigorous plan of campaign which, however, there is little hope of being followed. The notes are taken from *Proc. Roy. Soc. Med.*, April, 1913.

Personal Notes.

India Office.

From December 13, 1913, *to January* 10, 1914.

Arrivals Reported in London.—Major T. H. Delany, I.M.S.; Major J. N. Walker, I.M.S.; Major L. T. R. Hutchinson, I.M.S.; Major F. S. C. Thompson, I.M.S.; Major G. McPherson, I.M.S.; Captain G. T. Burke, I.M.S.; Captain G. McG. Millar, I.M.S.; Captain J. Morison, I.M.S.

Extensions of Leave.—Major C. R. Pearce, I.M.S., 3 m.; Major A. B. Fry, I.M.S., 1 d.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Burke, Captain G. T., I.M.S.
Fleming, Major J. K. S., I.M.S., to November 11, 1914.
Irvine, Lieutenant-Colonel G. B., I.M.S., to October 14, 1914.
M'Pherson, Major G., I.M.S.
McVean, Captain N. N. G. C., I.M.S., to June 11, 1914.
Millar, Captain G. McG., I.M.S., to November 25, 1914.
Nauth, Lieutenant-Colonel B., I.M.S., to October 14, 1914.
O'Leary, Captain J., I.M.S., to October 13, 1914.
Pearce, Major C. R., I.M.S., to June 15, 1914.
Roe, Colonel R. B., I.M.S., to May 14, 1914.
Shortt, Captain H. E., I.M.S., to April 9, 1914.
Stewart, Captain A. D., I.M.S., to October 1, 1914.
Whitamore, Captain V. N., I.M.S.
Woods, Captain J., I.M.S., to February 13, 1914.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Crossle, Captain H., I.M.S, N.-W. F. Prov., 6 m., October 6, 1913.
Delany, Major T. H., I.M.S., Behar and Orissa.
Dunn, Captain C. L., I.M.S., U.P. Sanitary Comm., 6 m., November 4, 1913.
Dutton, Captain H. R., I.M.S., Delhi, 12 m. June 3, 1913.
Fayrer, Major F. D. S., I.M.S., 15 m., September 25. 1913.
Haig, Lieutenant-Colonel P. B., I.M.S., 24 m., October 24, 1913.
Hulbert, Lieutenant-Colonel J. G., I.M.S., U.P., 6 m., November 12, 1913.
Hutchinson, Major L. T. R., I.M.S., Bo., 12 m., November 15, 1913.
Knapton, Major H. A. F., I.M.S., Bo. Sanitary Comm., 12 m., October 15. 1913.
Knox, Major R. W., I.M.S., India Foreign Department, 14 m., August 30, 1913.
McCay, Major D., I.M.S., B. Med., 7 m., September 1, 1913.
Morgan, Major E. J., I.M.S., U.P. 6 m., October 1, 1913.
Rainier, Major N. R. J., I.M.S., Cent. Prov., 23 m., 29 d., October 9, 1913.
Salisbury, Captain F. H., I.M.S., B. Gaols, 6 m., October 20, 1913.
Shaw, Captain W. S. J., I.M.S., Bo., 15 m., November 8, 1913.
Stevenson, Captain W. D. H., I.M.S., Bo. Bacteriological Laboratory, 13 m., October 4, 1913.
Thompson, Major F. S. C., I.M.S., B. Gaols, 24 m., November 15, 1913.
Walker, Major J. N., I.M.S., U.P., 12 m., October 30, 1913.

Notices to Correspondents.

1.—Manuscripts if not accepted will be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to The Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communication.

THE CULTURE OF LEISHMANIA FROM THE FINGER-BLOOD OF A CASE OF INDIAN KALA-AZAR, WITH SOME REMARKS ON THE NATURE OF CERTAIN GRANULAR BODIES RECENTLY DESCRIBED FROM THIS DISEASE.

By C. M. Wenyon, M.B., B.S., B.Sc.

Protozoologist to the London School of Tropical Medicine.

The possibility of obtaining cultures of leishmania from the peripheral blood of cases of kala-azar was recently demonstrated by Mayer and Werner upon a case of Indian kala-azar, which was under treatment in the Institute for Tropical Diseases in Hamburg ("Kultur des Kala-Azar-Erregers (*Leishmania donovani)* aus dem peripherischen Blut des Menschen." *Deutsch. med. Wochenschrift*, January 8, 1914). These observers inoculated one dozen tubes each with three to five drops of blood. Four tubes became contaminated, but on the twenty-ninth day the eight tubes remaining were all growing flagellates. This interesting observation I attempted to repeat upon a case of kala-azar from Calcutta, which was admitted under the care of Dr. F. M. Sandwith, in the Albert Dock Hospital.* Repeated examinations of the peripheral blood had failed to reveal any parasites, though these had previously been demonstrated by liver puncture. On January 20 six tubes of N.N.N. medium were inoculated, each with two to three drops of blood, obtained by pricking the sterilized finger of the patient. The tubes were then incubated at a temperature of 23°-25° C. Examined on the sixth and eleventh days no growth of flagellates was noted in the tubes, though one was contaminated with bacteria. The tubes were again examined on the eighteenth day, and in each of the five tubes free from bacteria flagellates were present in such numbers as to be easily seen with the low power objective. It is unfortunate that the peripheral blood of the patient was not examined for leishmania on the day the tubes were inoculated, but the long time intervening between the inoculation of the tubes and the appearance of flagellates in these in sufficient numbers to be detected proves that the leishmania must have been present in the blood in very small numbers. This development and multiplication of the leishmania in the test-tube is a practical demonstration of the possibility of the true invertebrate host becoming infected from the peripheral blood of cases of kala-azar.

Some time ago I was able to obtain a culture of flagellates from a case of aural ulceration, which was under the care of Professor W. J. Simpson. The patient, an Englishman, had an ulcer on the margin of the ear, which had appeared after a journey in South America. This had persisted for about two years, and had resisted the various treatments employed. I made smears from scrapings from the base of the ulcer, as well as from material obtained by puncture of the red margin. At the same time the red raised skin forming the edge of the ulcer was sterilized with alcoholic iodine solution. This was punctured with a needle, and material was obtained for inoculating three tubes of N.N.N. medium by inserting a fine glass pipette through the puncture wound. Prolonged examination of the various smears failed to reveal any leishmania, but after an interval of three weeks flagellates were present in one of the tubes inoculated, thus proving that leishmania had been present in the ulcer, and confirming the suspicion that the case was one of dermal leishmaniasis.

The culture method on N.N.N. medium can thus be used as a means of diagnosis in leishmania diseases, especially in cases of kala-azar, where spleen or liver puncture cannot be undertaken, and where one has failed to find leishmania in the peripheral blood. In some cases, as in the case of Oriental sore just mentioned, a diagnosis was made in this way alone. In animal experiments it is now a fairly common experience to obtain a culture from organs which have failed to reveal leishmania in stained smears. In many of these cases a more prolonged and careful examination of stained films might reveal the organism, but one rarely has time to devote many hours to such a search. In N.N.N. medium a single parasite may become a flagellate, and multiply in the course of a week or two till many thousands are present. In such cases the actual time spent on making the diagnosis is comparatively small. The only difficulty is with the N.N.N. medium, which may be a hindrance to anyone not accustomed to work with it. The medium itself is easy enough to prepare, and can be made by any laboratory assistant versed in bacteriological technique; 14 grammes of agar, 6 grammes of salt, and 900 c.c. of distilled water are dissolved in the usual manner, and distributed without filtering in test-tubes (1 inch in each tube). The tubes are plugged and sterilized in the autoclave. A rabbit is killed with chloroform, and tied out on its back. The thorax is painted with solution of iodine, and the heart exposed with sterile instruments. A sterile 20 c.c. syringe, with large needle, is used for drawing the blood directly from the heart. The agar tubes, which have been cooled to below 50° C., and in which the agar is still liquid, are held and opened by an assistant, and into each is introduced about 1 c.c. of blood, which has just been drawn from the rabbit's heart. The tubes are rolled in the hand to mix the still liquid agar and blood and sloped. When solid they are incubated at 37° C for twenty-four hours, to determine their sterility, when they are ready for use. Inoculation is made into the water of condensation which has collected in the tubes. They are then incubated at a temperature of 22°-25° C., after being covered with a rubber cap to prevent evaporation. By drawing the blood from the heart of a killed animal it is possible to obtain sufficient to make

* I am indebted to Dr. Low, under whose care the patient was when these observations were made, for permission to publish the case.

dozen to twenty tubes of medium. If, however, the operation is performed while the animal is still alive under anæsthesia, much more blood can be obtained, as the heart is still pulsating, and fills with blood after each quantity drawn off. In this case it is better to transfer the blood to small flasks containing beads for defibrination before distribution in the agar tubes. In order to watch the progress of the growth in the tubes, all that is necessary is to remove a small quantity of the liquid on a platinum loop, place it on a slide, and examine it with the $\frac{3}{4}$ or $\frac{1}{6}$ in. objective, with the condenser down. There is no need to cover with a cover-glass, as with a little experience the flagellates can easily be seen swimming about with the $\frac{2}{3}$ in. objective. Care must be taken to prevent bacteria gaining access to the tubes.

In cases of kala-azar and Oriental sore, in which prolonged search for leishmania in stained films has been negative, and in which the culture method has given a positive result, are we to suppose that the culture has resulted from some stage of the parasite not hitherto recognized, or from leishmania themselves, which have been present in numbers too small to be detected? In the Sudan, Archibald (*Journal of the Royal Army Medical Corps*, May, 1913) discovered in the spleen and liver of a case of kala-azar blue staining protoplasmic masses containing purple staining granules in varying number, but no leishmania. A monkey inoculated from the organs developed kala-azar with definite leishmania in its organs. It was suggested that the granular masses seen in the human subject might represent some hitherto unrecognized stage of the leishmania. More recently Statham and Butler (*Journal of the Royal Army Medical Corps*, December, 1913) have described similar bodies from the liver of a case of splenic enlargement in West Africa, and they suggest that they possibly represent the schizogonic stage of some protozoon, and in the light of Archibald's observation that kala-azar may exist in West Africa, and that these bodies are developmental stages of leishmania. The typical leishmania, however, could not be found in the smears. In the same journal Smallman describes similar bodies from the liver of a case of Mediterranean kala-azar. At this time no leishmania were found in the eight smears, though previously they had been found, so the author inclines towards the view that some stage in the development of leishmania is represented.

It might, therefore, be urged that it is some such a stage which is responsible for the appearance of flagellates in cultures when examination of smears has been negative. A very strong argument against this view is the fact that in all these cases it requires a long interval of two to three weeks for the flagellates to appear in the tubes in sufficient numbers to be detected. When the leishmania inoculated into the tubes are numerous, flagellates are present in great numbers in less than forty-eight hours, so that for any individual leishmania to reach the flagellate stage this length of time is necessary. The flagellates then multiply and increase in numbers. When the leishmania introduced are very few it may safely be assumed that they also become flagellates in about forty-eight hours, but that it is only after two or three weeks of multiplication that they are in sufficient numbers to be recognized.

Now, as regards the bodies which have been described by the various observers just quoted, no evidence whatever has been produced to prove their parasitic nature. Because protozoa consist of protoplasm and chromatin, it must not be forgotten that the cells of the higher animals consist of the same two substances, and in smears stained with Romanowsky stains the cytoplasm, whether of a protozoon or the cell of a higher animal, tends to stain blue, while the chromatin (and other granules also) stains varying shades of red and purple. And because certain stages of some protozoa are cytoplasmic bodies, containing many chromatin granules, it must be remembered that any portion of cytoplasm containing granules may give the same appearance if treated and stained in the same manner, for protoplasm is essentially the same wherever it occurs. Such simulation may give rise to error, and one must not be too hasty in concluding that appearances of this kind in smears of organs are produced, or are most likely to be produced, by parasitic protozoa.

For some time I have been working with experimental leishmaniasis in animals, and have been in the habit of performing liver punctures on these. On several occasions, in both dogs and rats, I have encountered in these liver smears the bodies described by the authors mentioned above. The bodies vary considerably. Sometimes they are exact reproductions of Archibald's coloured plate, at others they cannot be distinguished from those figured in the papers of Statham and Butler, and Smallman. I was at first surprised at this, though I did not think it possible that they represented any stage of development of leishmania. Accordingly, I checked the result by examining in the same manner the livers of other uninoculated dogs and rats. I found that exactly the same bodies might occur in these, so that any possibility of their being connected with the leishmania was at once done away with. The uninoculated animals were in perfect health, as, indeed, were most of the others which had been previously inoculated with leishmania, so that I doubt very much if the protoplasmic bodies with staining granules are of any pathological significance whatever. After careful examination of many films, I am quite convinced that the bodies in question are merely detached portions of the cytoplasm of large cells which are themselves charged with granules. The exact staining of the cytoplasm varies very much, and depends largely on the extent of disintegration of the cells and the amount of flattening to which they have been submitted in the process of film making. The detached portions of cytoplasm, being much thinner and more spread out, often stain differently to the cytoplasm of the intact cell. In cases of actual kala-azar spleen smears often show cytoplasmic masses, containing varying numbers of leishmania. These are known to be detached portions of the cytoplasm of the large macrophages, which are themselves filled with leish-

mania. In a similar manner the large granular cells of any organ may be broken in film making, giving rise to detached portions of cytoplasm containing granules which stain by Romanowsky stains. This is what has occurred in the case of the animals I have examined, and what I feel sure has happened in the cases described by Archibald, Statham and Butler, and Smallman. It may be that in some cases the granules represent a degeneration of some of the liver cells, but one must never forget that they may represent a purely physiological process, and be connected with digestion, in which the liver plays such an important part. The fact that in perfectly healthy animals such bodies occur is distinctly in favour of this view. Another point which must not be forgotten is that many kinds of material other than chromatin are coloured red with the Romanowsky stain and its modifications, so that one must not be too hasty in jumping to the conclusion that every red staining granule is chromatin. In the case of the bodies now under discussion it seems to me that the red staining granules they contain are probably deposits of some substance quite different from chromatin. But, whatever be the nature of the granules, the bodies themselves certainly represent no stage of schizogony of a protozoal organism, since they are derived from large cells from which they have become detached. Therefore, in Archibald's case mentioned above, in which these bodies occurred, and from which a monkey was inoculated and developed kala-azar, I think the only possible conclusion is that the monkey became infected from actual leishmania, which were present in the human being in numbers too small to be detected microscopically. This supposition is supported by the fact that the patient recovered without any treatment, so that the infection was, at any rate, a mild one. If the granules had represented leishmania, the liver must have been heavily infected. Similarly in the case of dermal leishmaniasis from which I obtained a culture, the flagellates resulted from leishmania actually present rather than from any granular stage undetected by me. Of three tubes of medium inoculated from the sore, it was only in one that flagellates appeared, and this after an incubation of three weeks.

It might have been advisable to illustrate in a coloured plate the bodies found by me in the livers of the animals, but this would have meant nothing more than a reproduction of the admirable plates accompanying the papers of the authors, who have described the bodies from human cases. A reference to these plates will show the bodies which I have found in the liver smears of both the healthy and experimental animals. They are certainly not parasites, and are derived from large cells, as already explained; but on the exact nature of the red staining granules in these cells I am not in a position to pronounce a definite opinion, though I do not think anyone could urge that they themselves are parasitic.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 16, 1914.

THE ACCLIMATIZATION OF ANIMALS IN THE ZOOLOGICAL GARDENS, LONDON.

THE subject of acclimatization of Europeans in tropical countries is discussed far and wide, and has been a question which has attracted scientific and other observers for a century or more. The reverse side of the problem, however, is seldom or ever referred to, namely the effect upon persons who belong to warm climates taking up their abode in temperate or cold climates. Migration of peoples northward or southward is a slow and very gradual process extending over hundreds or thousands of years; for there is really no recorded history of the sudden transmigration of any race of people of unmixed blood from one sphere to another where the climate is so markedly distinct as to stamp it equatorial on the one hand and cold on the other. The Europeans who go abroad go as a rule individually and not as a people. Young men go

out as members of the great public services military or civil, to merchants' offices or to banks, as engineers, miners, &c., but they remain, as a rule, from say a few years to as many as thirty years or over, when they return to their native land. The question therefore is acclimatization not of a race but of individuals for a period of their lives only. It may be said Australia affords an example of a white race settling in a warm climate, and no doubt this is so, but the chief centres of activity in Australia are as far south as possible, that is, in a climate as near that of the motherland as the continent of Australia can afford. The equatorial provinces are not sought after and, except for one or two towns on the Eastern shore of Queensland where the heat is modified by the temperature of the sea, there is but little attempt at colonization of the tropical tract. The tendency of peoples to migrate to colder climates we can find no recent example of. The West African negro thrives well in Equatorial America and in the southern provinces of the United States, but northwards from there we meet individuals only, just as we find white men in the Tropics engaged for a time in their commercial or other pursuits. The fact is we have insufficient data to go upon to deal with the acclimatization of races, be it a northward or a southward migration.

When the scientist cannot find sufficient material amongst human beings whereby to settle any point he may be inquiring into, be it physiological or pathological, he falls back upon observations to be obtained from animals. It may therefore be of some advantage to discuss what little has been observed upon the acclimatization of animals, although here again the migration has been not a natural one, unless we go back to prehistoric times, but rather an artificial one, inasmuch as man has been the factor in this transmigration as against the natural movement of the animals themselves. We know that dogs, cattle, horses and sheep are taken from Europe, especially Britain, and transplanted to tropical or sub-tropical climates; and *vice-versa* we attempt to bring animals native to the Tropics to our shores to fill our Zoological Gardens, and occasionally for other purposes. The information to be gathered from animals taken from Britain to the Tropics is not encouraging as an argument in favour of the possibility of acclimatization. In most instances disease intervenes in animals, as in the case of man, to annul the evidence. In the case of dogs, for instance, sent from England to the Tropics, disease is rife; they suffer so readily from parasitic infection of the intestines and of the blood that few live more than a year or so. "Worms in the heart" (*Filaria immitis*) is a constant danger in regions where the Filaria prevails; hydatids, intestinal worms, and a host of parasitic infections are ever at hand to shorten their lives, and the propagation and continuance of their species becomes well-nigh impossible.

In addition to disease amongst dogs and other animals, there is another factor that would appear to be due to climate alone. It is a curious fact that stallions, bulls and rams, taken from Britain to warm climates, lose their verve and ferocity. The pure-bred stallion degenerates in spirit, and impotency not uncommonly supervenes; the Shorthorn, Hereford or black-polled bull is no longer the rampant animal encountered in British pastures, but becomes tame and lethargic; and the pusillanimous ram during a short residence in the Tropics becomes quiet as a ewe. Even cats sent to the Tropics soon cease to kill rats, for which purpose they had been specially imported. In warm climates farmers have continually to bring out fresh males from Britain, be they bulls, stallions or rams, to replenish their breeds, which otherwise would tend to dwindle in physique and temperament. It may be that disease has caused this change in temperament, and, on the other hand, it may be "climate" alone. "Climate" must, however, be taken in the widest sense, for, apart from the heat of the atmosphere, the vegetation peculiar to the climate may be the cause of much of the loss of verve, &c., in animals; for the pastures of the Tropics are not the meadows of England; cut grass or hay of a warm climate has not the sustenance of English hay, nor are the root crops of the quality which obtains in Britain. In discussing the acclimatization of men and animals suddenly transplanted from a cold or temperate climate to the Tropics, it is evident that many things have to be taken into consideration, and it may be safely stated that at the present time we have not sufficient data to go upon to come to any scientific conclusion one way or the other.

Dealing now with the other aspect of this vexed question, we have to consider the sudden transference of animals from warm climates to British or northern European shores. Our Zoological Gardens are really the only available sources of information on the subject; it is only since the work at the Zoological Gardens, London, has been conducted scientifically that any reliable information has been forthcoming.

Mr. H. G. Plimmer, F.R.S., the pathologist at the Zoological Society's collection of animals in Regent's Park, London, contributes in the recent report of the Society an interesting account of the death-rates and longevity of the animals in the Zoological Gardens during the past year. Observations show that of the total number of deaths wellnigh half occur within the period of six months after the animals were admitted. This would appear as if it was impossible to acclimatize certain species of animals to the British climate, and that from that cause many die. But there are so many side issues which bear upon the subject that the question of acclimatization is almost ruled out. There is the journey down country to the port of embarkation, the trials of a sea journey, the transference from ship to shore and to the Gardens to be thought of; the weakness of the animal when caught, its age whether very old or quite young, and the fact of captivity, each and all bring about a state of health which is apt to prove detrimental to the newly arrived animal. Yet, allowing for this, it is difficult to believe but that change of environment, of temperature, of food and water, and all that appertains to so-called climate, plays a considerable, if not the largest, part in the death-rate. After the first six months the mortality markedly lessens, until in mammals it amounts to but 16 per

cent. of the total, in birds 10 per cent., and in reptiles 13 per cent. Amongst animals passing suddenly from the south to the north the danger to life is during the first few months, so in man passing from north to south it is in the first twelve or twenty-four months that he is most likely to be attacked severely by the prevalent diseases of the region of sojourn. In man it is usually after the first few months, when the initial stimulus of heat has worn off, to be succeeded by a corresponding depression, that illness declares itself. The powers of resistance have declined, and pathological agents gain the upper hand.

The chief infectious diseases amongst the animals in the London Zoological Gardens are tuberculosis, mycosis and pneumonia. Tuberculosis prevailed mostly amongst small creatures living in one of the warmest houses of the Gardens, in which the temperature is maintained at an even level. Snakes suffered more from pneumonia than any other section of the animals; it was found that increased heat in the reptile house caused a greater activity amongst the snakes, but brought about a prevalence of pneumonia, which was most pronounced. Although many of the animals from Africa were collected in places where sleeping sickness prevails, in no instance were pathogenic trypanosomes met with when the blood was examined. In a mouse from the Sudan, and in eight birds and two frogs, trypanosomes were seen, but of a kind non-pathogenic to man.

It must be remembered that wild animals are rendered more liable to capture by three conditions: a tender age, old age, and disease; it is one thing to secure a very young or a very old animal, quite a different thing to secure a healthy animal in its prime. To infancy and old age belong certain ailments, which may hasten death when transferred to the unnatural environment of captivity and the trying effects of an altered climate, however warm their dwelling may be kept. Disease also facilitates capture; a monkey in health may baffle pursuers, whereas if it is the subject of illness its inability to escape renders it liable to be caught by man or other animals. A snake finds difficulty in capturing a healthy, active monkey, whereas the same animal, when hampered by disease, falls an easy prey. It is possible, therefore, that the animals captured for our Zoological Gardens may be either too young or too old to be suited for the experiment of emigration from a hot to a cold climate, and that disease in some form being present at the time of its capture, thus rendering the animal more liable to be secured, may increase the mortality rate of new admissions over and above the direct effects of climate merely.

The circumstances recounted above, to which many more could be added, serve to show that it is difficult to ascertain whether in mankind or in animals it is possible to say how much climate *per se* has to do with the illness and mortality in the question of acclimatization.

J. C.

Abstracts.

LEPROSY.*

By Victor G. Heiser.

Surgeon, United States Public Health Service, Chief Quarantine Officer and Director of Health for the Philippine Islands.

Treatment of Two Cases with Apparent Cure.

Two lepers, in addition to those previously reported as successfully treated with hypodermic injections of chaulmoogra oil and resorcin, have been discharged from San Lazaro Hospital, Manila, after having been free from leprosy for a period of two years. The principal interest in these cases is in the fact that, unlike the two preceding cases, which were reported as having been released as apparently cured, the cases here reported received no vaccine treatment. They were also very mild cases. The history is briefly as follows:—

F. A., female, aged 11, a native of Zamboanga, Moro Province, was admitted to the San Lazaro Hospital, January 5, 1911. She had large leprous macules over the outer surfaces of both legs, extending from the malleolus almost to the knee, and similar large leprous macules upon the forearm. The diagnosis was microscopically confirmed. The use of chaulmoogra oil by mouth was begun, January 7, 1911, in ten-drop doses three times a day, with one-sixtieth of a grain of strychnine. By February 15 the nausea became so great that the patient refused to take any more of the oil by mouth. Hypodermic injections with the formula composed of chaulmoogra oil, resorcin, and camphorated olive oil was started on February 15, 1911, in 1 c.c. doses. The injections were repeated at weekly intervals and gradually increased in quantity until they reached 12 c.c. per dose by April 20. The dose was then gradually reduced in the same period as it was increased until 1 c.c. was reached and then gradually increased again to the maximum dose. On October 15, 1911, the patient was microscopically negative for leprosy. From that date until January 7, 1913, the patient absolutely refused to take any form of treatment. Microscopical examinations made from time to time during this period resulted negatively. From January 7, 1913, until October 30, ascending and descending doses of the chaulmoogra oil mixture were administered as before. A few months after the original hypodermic injection of the oil was begun the leprous macules began to ulcerate. These ulcers gradually healed and by October, 1911, were entirely scarred over. A final microscopical examination was made October 30, 1913, and no leprosy bacilli could be found nor was there any clinical evidence of the disease. The only signs observable were the scars where the leprous lesions had previously existed. The patient was discharged October 30, on probation, as being apparently cured.

The other case is that of C. A., Filipino, aged 40,

* "Public Health Reports," vol. xxix, No. 2, January 9, 1914.

who was admitted to the San Lazaro Leper Hospital on May 4, 1911, with the diagnosis of leprosy, which was microscopically confirmed. He had a large, dark, pigmented leprous macule, approximately 5 by 10 cm. in outline, on the outer side of the leg above the malleolus. He had a similar lesion, but somewhat smaller, which involved the area above the left ear and some infiltration of the lobe of the left ear. Upon admission to the hospital the chaulmoogra oil mixture was injected into the buttocks at weekly intervals, with an initial dose of 1 c.c., which was gradually increased to 5 c.c. When efforts were made to give him larger doses he suffered from severe palpitation of the heart and a precordial distress. The leprous macules began to improve a few weeks after the treatment was started and had entirely disappeared by August 25, upon which date the leprosy bacillus could no longer be found. After August 25 he refused further treatment. He was then placed under observation in non-leprous quarters. Microscopic examinations were made from time to time, all of which resulted negatively. He was microscopically examined on November 4, 1913, with negative results, and has been discharged from San Lazaro Hospital on probation, the same as other cases.

EPIDEMIOLOGIC STUDIES OF ACUTE ANTERIOR POLIOMYELITIS.*

By WADE H. FROST.

POLIOMYELITIS is due to a specific infective agent, of which the only demonstrated natural sources are infected human beings, who may be divided into the following groups: The recognized sick, convalescents, the sick not recognizable as poliomyelitis cases, and passive virus carriers apparently in good health. The infective agent is known to be discharged from these sources in the excretions of the respiratory and digestive tracts; it is known to be fairly resistant to the destructive agencies encountered in nature outside of the human body, and to be capable of gaining access to the tissues of monkeys and causing infection through the apparently uninjured mucous membrane of the nose; also, though less constantly, through the digestive tract and through the agency of certain biting insects of wide distribution in nature.

The disease is, in nature, of widespread though rare sporadic or endemic occurrence. In epidemics it has occurred in recent years over a large part of the world, the outbreaks being sometimes discrete, at other times spreading rapidly, but irregularly over wide areas. Such epidemics characteristically run a rather rapid course in a given community, declining after a few months or less, after having attacked (so far as is evident) only a small proportion of the total inhabitants, usually not more than one in a thousand; and do not recur in the same locality for a period of at least two years. In epidemic foci children under 5 are attacked much more often than are older persons, the whole adult population remaining virtually immune in some epidemics.

The rapid spread of epidemics over wide areas, their spontaneous decline after only a small proportion of the inhabitants have been attacked, and, above all, the preponderating incidence in young children have not been satisfactorily explained by any hypothesis other than that the infective agent, during epidemics, is widespread, reaching a large proportion of the population, but only occasionally finding a susceptible individual, usually a young person, in whom it produces characteristic morbid effects.

The conclusion that susceptibility to poliomyelitis is comparatively rare, and that the incidence of the disease is limited chiefly by a general immunity rather than by the dissemination of the virus, is reached primarily by exclusion, since no other hypothesis yet advanced satisfactorily explains the epidemiological peculiarities of the disease. The conclusion is, however, greatly strengthened by direct evidence, namely, the demonstration of the virus in the secretions of healthy persons. Obviously, the fact that these persons, though carrying the virus in their secretions, have developed no clinical evidence of infection, is proof of their insusceptibility. Should passive carriers be shown to be actually more numerous than clinically recognizable cases of poliomyelitis, then it will be proven that immunity to this infection is more general than susceptibility.

The only definite conclusion, then, which is drawn from the epidemiological studies of poliomyelitis is that the infective agent is, during epidemics at least, quite widespread throughout the population affected, the incidence of the clinically recognizable disease being limited by the relatively rare susceptibility to the infection. This conclusion, in the light of our present knowledge, holds equally well whether it is assumed that the route of infection is through contact, through insects, or through dust; whether the ultimate sources of infection are human beings or lower animals.

As to what constitutes susceptibility or the converse—immunity—practically nothing can be deduced except that age is obviously a factor of importance, susceptibility being generally greatest in the first half decade of life, thereafter progressively diminishing until in adult life there is a very general immunity to natural infection.

The reason for this is at present a matter of speculation. Conceivably the greater immunity of adults may be due to a non-specific resistance, developing naturally with maturity, without reference to previous exposure to or infection with the specific virus of poliomyelitis.

On the other hand, there are certain facts which suggest that the very general immunity of adults may be specific, acquired from previous unrecognized infection with the virus of poliomyelitis. The facts which suggest this are as follows:—

(1) Poliomyelitis is known to occur in forms quite difficult to recognize clinically. There is, indeed, good reason to believe that even during epidemics

* *Bulletin* No. 90, Hygienic Laboratory, United States Public Health Service.

the number of cases without paralysis exceeds the number of paralytic cases. The occasional development of typical paralysis without any distinctive premonitory or accompanying constitutional disturbance illustrates how insidiously the disease may run its course. It is obvious that such cases, without the development of paralysis, which may perhaps be considered as a complication or accident, would never be recognized as poliomyelitis.

(2) The perennial occurrence of sporadic cases shows that the infection is and has been endemic, at least in this country, for a number of years. The morbidity returns for the last few years indicate that the disease is constantly present, especially and most constantly in the large cities.

(3) The spontaneous decline of epidemics in localities where only a very small percentage of the population have been attacked, and the subsequent immunity of these localities while the epidemic spreads in contiguous localities suggests that a population may be immunized by an epidemic giving rise to only one recognized case of poliomyelitis among several hundred or several thousand inhabitants. The immunity of the third ward in Buffalo during the time that the adjacent wards were suffering most severely is an excellent illustration of this apparent immunization of a large group of people. A much more striking illustration on a large scale is afforded by the history of the Swedish epidemic of 1911, sparing, as it did, the localities chiefly affected in 1905, while attacking most severely localities immediately contiguous.

(4) From admittedly imperfect statistics the immunity of adults appears to be, in this country at least, relatively greater in large, thickly populated cities than in smaller towns, especially greater than in rather remote rural sections. This is deduced from the comparative age incidence in rural and metropolitan epidemics, it having been noted that in large cities cases during epidemic outbreaks are confined more exclusively to children aged under 5 years. This suggests that persons residing in densely populated large cities have been more generally immunized in early life than have those living in more remote rural sections, as would be expected, considering the greater chances for contact in large cities. The same conclusion is again suggested by the fact that in rural districts the total incidence of epidemic poliomyelitis is characteristically higher than in large cities.

(5) While it seems at first almost inconceivable that a disease like poliomyelitis could be very generally endemic without being more often recognized, the hypothesis that it may be so is supported by some fairly close analogies. For example, typhus fever, though not believed to be widespread nor common, undoubtedly did exist endemically in New York and other cities for a number of years without being recognized, notwithstanding that numerous cases came under the most careful clinical observation. The same is probably true of pellagra and undoubtedly true of uncinariasis in the United States.

Yellow fever occurs endemically and perennially in some places almost unnoticed, the cases being apparently confined to newcomers and young children, and in the latter being often, if not usually, unrecognized, early attacks being in fact deduced chiefly from the general immunity exhibited by these people in later life.

Measles, though not occurring commonly in unrecognized form, furnishes an analogy of a disease which in communities where communication is free is almost exclusively a disease of children, apparently for the reason that the adult population have been immunized by previous attacks. When introduced into territory that has long been free from the infection, measles attacks adults and children alike.

THE UNIFORM SUCCESS OF SEGREGATION MEASURES IN ERADICATING KALA-AZAR FROM ASSAM TEA GARDENS.*

By J. Dodds Price, M.R.C.S., L.R.C.P.
AND
Leonard Rogers, M.D., I.M.S.

In 1906-7 we investigated together the problem of the epidemiology of kala-azar on tea gardens in the Nowgong district of Assam. In 1895 new lines were built for a number of freshly imported coolies arriving on the Rangamati tea estate. Rogers commenced his investigations in the Nowgong district in April, 1896, and as the result of detailed inquiries he independently arrived at the conclusion that the infection was a house one, as fully recorded in his original report of 1897 and in "Fevers in the Tropics."

On investigating together, in 1897, the effects of bringing into use the new lines at Rangamati, it was found that no case of kala-azar had occurred among 150 coolies who had then resided there for two years. Yet out of fifty coolies of the same batch who had been living in the old infected lines, for want of room in the new ones, no fewer than 16 per cent. were already dead of kala-azar, while others were suffering from the disease, and that in spite of the fact that the new lines were situated only 300 yards from the old ones.

It was therefore decided to ascertain if the disease could be stamped out of already infected coolie lines by moving out all the healthy persons into newly built lines, and segregating the remaining infected families. As it was then impossible to diagnose the disease in its early stages from ordinary malarial fever (kala-azar being at that time regarded by us as a peculiar severe epidemic form of malaria), it was decided to move into the new lines no person in whose household any cases of kala-azar had occurred, lest some of them might already be suffering from an early stage of the disease, and thus carry the infection with them. At the Old Solona out-garden lines of the Rangamati estate the infection was so severe

* Abstract of a paper in the *British Medical Journal*, February 7, 1914.

in this community that no fewer than 144 out of 240 souls had cases of the disease in their households, so that only the remaining ninety-six people could be moved, while five of these had to be sent back very soon after on account of developing fever. The new line was filled up with freshly imported coolies, who now number 800 workers, and to this day—that is, for sixteen years—they have remained absolutely free from kala-azar. Of the ninety-six people who had to be left in the old infected lines nearly all contracted the disease and died of it during the next few years. Moreover, the kala-azar spread to a contiguous line with sixty healthy coolies, who had worked for years on the estate, and who refused to move into new lines. One-third of them died of the disease within the next fifteen months, and the rest nearly all succumbed or left the estate during the few succeeding years. Their huts have now ceased to exist, and with them the dread disease has disappeared from that neighbourhood. Nevertheless, the new lines—which have now remained free from kala-azar for sixteen years—are only 400 yards from the old ones, which continued to suffer so severely for several years after the new lines were inhabited.

The remarkably successful result obtained in this first experiment has encouraged other tea-garden managers and directors to repeat the procedure in connection with coolie lines infected by kala-azar. The results obtained during the last sixteen years have been uniformly successful, and absolutely prove the soundness of the measure, thus rendering this measure one of the first importance in dealing with the most terrible disease of India, and also throwing considerable light on the probable mode of infection.

As there have been no material extensions of the area under tea in the Nowgong district during the period of time dealt with owing to the difficulty in increasing the labour force, the present working population of the coolie lines is much the same as formerly. Kala-azar has been stamped out of a labour force of nearly 7,000 workers, after it had caused a mortality within a few years of 207 per mille, and although, subsequently to moving the coolie lines, over half of the infected households which had to be left behind on the infected sites died of the disease. As it costs from £7 to £14 to recruit a coolie, and the average duration of the illness is at least seven months, during which food and treatment costs £4, it is clear that, in addition to the great saving of life and suffering, the financial aspect of the case to the tea industry is of great importance.

The Amluckie Tea Garden Outbreak of 1896-1904.

The mortality from kala-azar in 1899 and 1900 amounted to no less than 128 and 106 per mille, while in the previous two years it had also been very high, although unfortunately the exact figures are not now available. The sudden drop in 1901, after the new lines had been occupied, to under 9 per mille deaths from kala-azar, and the complete and lasting eradication of the disease within a year after the completion of the new lines, are conclusive in regard to the effectiveness of the measure. It is not too much to say that this fine estate was saved from very great loss, if not ruin, by the measure under consideration. The high case mortality of about 90 per cent. shows the virulence of the outbreak.

The Seconee Tea Garden Outbreak of 1908-13.

This garden escaped infection by kala-azar until some years after the epidemic had died down to a great extent in the Nowgong district. Nevertheless, when the disease did break out, it ran an acute epidemic course with a high death-rate, thus showing that tea-garden coolies, who are mainly recruited from parts of India where kala-azar is comparatively rare or totally unknown, are liable to severe outbreaks of the disease, should the infection once gain a footing among them. The number of deaths to October, 1913, has been 151, the complete recoveries amount to twenty-one, while two cases are still under treatment. Omitting the last two, whose condition is still doubtful, the case mortality has been 87·8 and the recovery rate 12·2 per cent., or a little over that of the Amluckie outbreak of ten years earlier, thus showing no appreciable diminution in the virulence of the disease.

In May, 1911, new lines were constructed, into which 300 healthy people were moved, leaving behind in the old lines ninety-eight persons with the infection in their households; all the uninhabited huts in the old lines were destroyed. Of the ninety-eight people left in the infected lines twenty-three have died within the ensuing two and a half years; being nearly one-fourth of the whole labour force of the estate. The new lines are situated some 600 yards from the old site, but on higher ground. It is also worthy of note that, owing to no water being obtainable in the new lines except by digging a deep well, the old well was exclusively used during the first year after the new lines were opened, and it is still used during the dry cold and early hot weather months, when the supply in the new well runs short. Nevertheless, the kala-azar rapidly died out after the lines were moved, only two cases now remaining. Only one of these had lived in the new lines, and he was a bungalow servant, who used also to visit the neighbouring villages and markets. At Seconee, then, there was no change in the drinking water, which can therefore be excluded as being in any way associated with the incidence of the disease. Segregation was adopted here earlier than in the former cases, although not until very serious loss of life had occurred from kala-azar. It was very noticeable at Seconee, as in all former outbreaks on tea gardens, that it was the acclimatized coolies, who had worked for years on the estate, who succumbed to kala-azar. Their loss is particularly serious from the labour point of view, as it is now impossible to replace them by an equally good class of workers, and as they are very rarely sick they form the backbone of the labour force.

The Results of Removal.

The above two examples demonstrate how simply and certainly a serious outbreak of kala-azar can be controlled and, within a comparatively short time, completely eradicated from very badly infected coolie lines of tea estates by the measures advocated. In fact, it would be difficult to find a more successful method of dealing with such a deadly and ruinous human disease in the whole range of preventive medicine. It is particularly worthy of note that this efficacious measure was worked out as a result of epidemiological studies, at a time (1896-7) when we were ignorant of the true nature of kala-azar and its mode of infection; while it was not then even known how the infection of malaria itself was conveyed from one person to another. The facts collected having established that the infection clung to the houses or their sites, this sufficed to enable us to evolve a simple plan of dealing effectually with the epidemic which was ravaging the Nowgong district and ruining its chief industry.

The Indefinite Occurrence of Kala-azar in Coolie Lines once Infected if Segregation Measures are not carried out.

The following is an account of the disease in two control lines:—

Solona.

This estate, which contains two coolie lines, called Solona and Borghot, became infected with kala-azar as early as 1896. The partial measure of removing the evident and suspected cases of kala-azar from the infected lines to a segregation camp during the four years from late in 1897 to 1900 had a very beneficial effect in greatly reducing the number of deaths from the disease subsequently. The kala-azar camp was broken up at the end of 1900, and two years later the deaths in the old infected lines began to mount once more from five in 1901 to fourteen in 1902, while the figure reached twenty-four in 1904. In 1905 a marked decrease again occurred, which lasted for six years. This decline in the disease coincided with the carrying out of the following measures. Disinfection directed towards the destruction of bed-bugs was carried out in all the infected houses in the Borghot lines in the hot season of 1905, and it is worthy of note in this connection that the Borghot lines had only about half the number of deaths that occurred in the Solona lines during the following six years, although the population of the former (850) is considerably greater than that of the latter (650). An even more important factor was doubtless the construction of new lines only a few hundred yards from the old Borghot lines, in the cold season of 1905-6, into which all the newly imported coolies were placed. This new line has remained almost entirely free from kala-azar during the last eight years, the few cases which did occur being due to carelessness on the part of the manager in allowing admissions of coolies from the infected lines. In 1901 a distinct recrudescence of the disease took place in the two old infected lines, fifty-two deaths having occurred within just under three years, undoubtedly due to newly imported coolies being again placed in the old lines, owing to the new ones having become filled up. It is thus abundantly clear that the partial measures adopted in the case of this estate have failed to eradicate the disease, which has caused more deaths during the first eleven months of 1913 than in any year since 1899, when the kala-azar camp was in full use.

We have here the clearest evidence that as long as fresh material, in the form of newly imported coolies, is introduced into infected lines, so long will the disease continue to exact a heavy toll in lives, with consequent serious financial loss. The construction of new lines has at length been commenced, into which all healthy families will be moved out of the infected lines, as many as possible of the old houses in which will then be destroyed and the remaining infected families segregated in one of the old lines.

Rangamati Old Lines.

Here the disease broke out as early as 1894, and has continued ever since—that is, for almost twenty years—in the old lines, which have not been moved, although the new lines, only 300 yards distance, have remained free since they were built in 1895.

Here, again, we have a clear illustration of the continued occurrence for an indefinite period of kala-azar in infected lines, which have not been dealt with by removal of the healthy families and prevention of the admission of newly imported coolies. This instance is all the more striking from the fact that only 300 yards away is situated the first of the newly constructed lines, from which all kala-azar cases have been carefully excluded, and which has remained quite free from the disease for no less than eighteen years, during the whole of which period cases have continued to arise yearly in the old infected lines. Again, we have here further proof of the fact that the old acclimatized coolies, who have lived for years on the estate, many of them having been born and bred there, are sooner or later attacked by the deadly disease, if they continue to reside in infected lines, although they seldom suffer from other serious disease, and form the most valuable and reliable portion of the working population.

The continued occurrence for from eighteen to twenty years of cases of kala-azar in the only two infected coolie lines in the Nowgong district, which have not been dealt with by means of the segregation measures, which we have shown to have been uniformly successful in the case of the ten consecutive lines in which they have been carried out, furnishes the most convincing evidence possible that the complete eradication of the terrible kala-azar from every garden where this plan has been fully put into execution has really been due to the methods advocated.

THE BEARING OF THE SUCCESS OF SEGREGATION MEASURES ON THE PROBABLE MODE OF INFECTION OF KALA-AZAR.

The uniform success of the prophylactic measures, based on the observation that the infection of kala-

azar clings to the houses and their sites, is a fact of great importance in considering the probable mode of infection of the disease. As it has been proved that a distance of a few hundred yards—not more than 300 to 400 in certain instances—suffices for the permanent protection of coolie lines, provided no infected person is allowed to reside in them, we may exclude any mode of infection through such flying insects as mosquitoes. Moreover, malarial fever soon becomes as rife in the new lines as in the old ones, a malarial infection rate among children of about 80 per cent. in both old kala-azar infected lines and in a new one which had been free from the latter disease for several years, so there could have been no lack of mosquitoes in the new lines. This high endemic index accounts for the number of kala-azar patients found to be infected with malarial parasites in 1896, that is, several years before the frequent malarial infection of apparently healthy people was known.

Indications for a Non-flying Insect Carrier, most probably the Bed-bug.

It will be evident that a considerable number of people may live for several years in the same lines, or even, as often happened, in the same house as other persons infected with kala-azar, and yet entirely escape the disease. The further fact that if people go on living long enough in such infected houses or lines the great majority of them do eventually contract the disease, so that after a number of years almost the entire population of a set of contiguous huts may die of kala-azar, appears to show that the slowness of infection is not due to any lack of susceptibility to the disease, and that in the very same lines every soul is likely to contract malaria over and over again within the same period of time. It would appear from these facts that, if even one bed-bug in a hundred was capable of carrying the infection of kala-azar, every person in an infected house would rapidly develop the disease. Moreover, the comparative rarity of the parasites in the peripheral blood, as compared with malaria, alone accounts for much of the difficulty in experimental and natural infection of the insects. It would be quite sufficient for bed-bugs only very rarely to become capable of conveying the infection, under conditions an exact knowledge of which is not yet available, to enable them to be efficient carriers of the disease.

In this connection we may refer to the experiment carried out with a view to ascertaining if measures directed against the bed-bug would prove effective in freeing houses from infection. Fumigating the houses with sulphur, disinfecting the beds with solution of corrosive sublimate in boiling water, and burning old clothes were followed by the disappearance of the disease from a row of badly infected coolie huts for several years, but this measure was found to be troublesome and expensive. Moreover, cases reappeared in other parts of the lines, and the disease was not completely stamped out. Burning the thatched roofs in the houses also failed to prevent subsequent cases occurring in them. The mud walls of these houses were over 2 ft. in thickness, and the flames died down long before the whole thickness of the walls could have been sufficiently heated to destroy all the bed-bugs within their crevices, so that the failure of this measure can easily be understood. It is also known that bed-bugs can live for many months without food, so that the clinging of the infection to houses harbouring them is not surprising. Were it not for the facts now known regarding the life-history of the parasite, the evidence would go far towards incriminating the actual soil as well as the houses; but on the whole the bed-bug theory best accounts for all the known facts, including a few instances of infection of Europeans through cohabiting with native women suffering from kala-azar. The development of the parasite into the flagellate stage in bed-bugs obtained by Patton goes very far towards establishing this theory.

The success in ten consecutive tea gardens where the segregation methods have been carried out is sufficiently convincing evidence of the infectiousness of the houses, and possibly of their sites, to enable this theory to be safely acted on until such time as the problem is completely and finally solved. Unfortunately, the measures which can be adopted in tea-garden coolie lines cannot be so easily carried out in the case of infected villages or isolated sporadic cases, although the principles remain the same in either case, and further efforts in this direction are much to be desired.

The Permanency of Recoveries from Kala-azar.

Scepticism is not rarely expressed as to whether undoubted kala-azar is ever recovered from. In hospital practice it is only exceptionally possible to follow up patients for a sufficiently long time to prove the occurrence of complete and lasting recovery. Several European children have not only recovered but have remained quite well for a number of years. During twenty years' experience in Assam, in upwards of 2,000 cases from first to last on tea estates, there were over 150 complete and permanent recoveries, in which the patients continued to do full work for years. In the tea-garden cases the recoveries have not followed any special line of treatment, but not infrequently occurred most unexpectedly. It sometimes followed on a septic infection, as in one of the cases, in which gangrene of the scrotum was the turning point in the course of the disease.

Annotations.

Cultivation of Piroplasma canis.—J. G. Thomson and H. B. Fantham (*Annals of Tropical Medicine and Parasitology*, December 30, 1913) have succeeded in cultivating *Babesia* (*Piroplasma*) *canis* in two out of four attempts, following the method of Bass, using blood and glucose, and incubating at 37° C.

In one of their cultures, starting with heart blood containing corpuscles infected with one, two, or,

exceptionally, four piroplasmata, they succeeded in obtaining a maximum of thirty-two merozoites in a corpuscle. Various types of Babesia were seen in their cultures, namely, pyriform, amœboid, rounded and oval parasites. Division of rounded forms was observed, following the method of gemmation with chromatinic forking. There was evidence, in stained specimens, of direct binary fission. Hæmolysis occurred in all the culture tubes.

A puppy was successfully inoculated from a forty-one hours' culture, and succumbed to piroplasmosis on the fifth day.

The authors find that *Babesia canis* is not so easily cultivated by Bass's method as the malarial parasites of man.

Pellagra in America.—Gehring (in the *New York Medical Journal*, December 20, 1913) reports three cases of pellagra seen in Oxford County, Maine, during the past spring and summer.

These cases, together with others recently reported by Lee, of Boston, and McDonald, of the Danvers State Hospital, fail to establish the etiology of the disease, but they confirm the belief, becoming every day more general, that pellagra is not a disease peculiar to tropical regions. These patients had never been out of the State and had lived continuously in Oxford County, where they had been born. All had gastro-intestinal symptoms and typical skin lesions, but as yet only two have presented mental abnormality. In two, mental symptoms preceded those of the gastro-intestinal tract and skin, whereas in the third, although the skin looked as if painted with iodine, and diarrhœa had been a distressing symptom; as heretofore stated the mind had not become affected.

One's home was crowded and dirty; the others lived in clean, sanitary dwellings, but all had spent their days in one of the garden spots of the earth—Oxford County, Maine.

Trypanosomiasis.—Blacklock and Yorke, writing in the *Annals of Tropical Medicine and Parasitology*, December 30, 1913, discuss the probable identity of *Trypanosoma congolense* (Broden) and *T. nanum* (Laveran).

In a paper published by them on the identification of the more important mammalian trypanosomes, *T. dimorphon* (sensu Laveran and Mesnil), *T. confusum* (Montgomery and Kinghorn) and *T. pecorum* (Bruce) were regarded as synonymous with *T. congolense*, which was first described by Broden in 1904. In the same year Laveran described a similar parasite found by Balfour in the Sudan, under the name of *T. nanum*. These parasites are identical morphologically in that they are both short aflagellar trypanosomes measuring 8 to 19 microns in length. The sole distinguishing feature is their effect on small laboratory animals, *T. congolense* being described as pathogenic for monkeys, dogs, rabbits, guinea-pigs, rats and mice, while *T. nanum* is considered to be incapable of infecting these animals. The object of the present paper was to examine the evidence upon which this distinction is based and to decide whether it is sufficient to warrant such a differentiation.

As the result of their investigations and of those of the authors mentioned above, Blacklock and Yorke can see no evidence which would justify them in distinguishing one from the other on the ground of pathogenicity. In the present state of our knowledge they can only conclude that *T. congolense* and *T. nanum* are the same parasite.

Exanthematic Typhus.—Naunyn (*Deutsche medizinische Wochenschrift*, December 4, 1913) believes this to be a collective term, which indicates several distinct members. Naturally we could not form a distinct conception of this affection until abdominal typhus had been thoroughly dissociated from it. In fact, our knowledge of the spotted typhus as an entity dates only from 1849, and is not necessarily the terrible typhus of the Napoleonic wars. The two new diseases were studied side by side. In the author's time they were badly confused, autopsy results giving the lie to diagnosis. Critically speaking, there are no *post-mortem* appearances which characterize typhus. Much stress was laid on the quality of the rash *intra vitam*, and this exhibited great fluctuations (maculæ, petechiæ, marmorization). Many acute infectious diseases present a picture not unlike typhus, as Weil's disease, certain cases of malaria, Brill's disease, Manchurian typhus, &c. Brill's disease is especially instructive, as illustrating the impossibility of separating it wholly from true typhus, tabardillo, &c. In times of great epidemics typhus and the bubonic plague behave in much the same manner. Indeed, judging only from this behaviour one might decide that they represent one and the same epidemic. This view was expressed by Murchison many years ago, who added that spotted typhus played the very same *rôle* in the temperate zone that bubonic plague did in the Tropics. We have not yet found the germ of any of the typhuses; and when we do, should not be surprised to find several of different sorts. In any case, the author feels confident that ultimately "typhus exanthematicus" and "fleckfieber" will disappear from our nomenclature.

A New Type of Typhus in East Asia.—Furth, who is stationed in China, reports (*Münchener medizinische Wochenschrift*, December 2, 1913) an episode which tends to bear out Naunyn's recent claim that typhus is more a syndrome than a disease. In the group of six cases treated, the exciting cause appeared to be the usually saprophytic *Bacillus fæcalis alkaligenes*. Ordinary typhoid was readily excluded. The bacillus just named was found in the blood and intestinal discharges. The patients were sailors on the same vessel. The symptoms which ushered in the attack were violent headache and pain in the limbs with great fatigue. Fever of 39° C.

Aside from a slight pharyngeal congestion there were no local symptoms whatever. The pulse was accelerated, but the heart and blood-picture unaltered. There was barely a leucocytosis. The urine gave a positive diazo reaction, but nothing further abnormal. The fever curve showed great variation, but was of the same type for all. All patients recovered unharmed, save one left with myocarditis. An exanthem is not mentioned, and Naunyn implies that the existence of one is not indispensable. Neither are stupor and apathy mentioned, perhaps because of the benign character of the episode. The febrile period extended between three and four weeks, and two patients had a relapse. Naturally the *B. fæcalis alkaligenes* may have been associated in the blood with an invisible causal germ, and may have simply played a saprophytic *rôle* save that its liberated endotoxins may have modified the disease picture.

Treatment of Leprosy.—In the Report of the Surgeon-General of British Guiana for 1912-13, the Medical Superintendent of the Public Leper Asylum, Demerara, Dr. F. W. Wills, states that in view of the unfavourable reports that have been made of the value of nastin in the treatment of leprosy, nastin is not now supplied for routine treatment at the asylum; he adds that in four cases discharged as cured by nastin all returned later to the asylum showing evidence of the disease; but he remarks that the treatment was completely discontinued when the lepers left the asylum. Of eleven cases of nodular leprosy treated by one of three strains of leprosy bacilli extract prepared by Dr. Bayon, of the Lister Institute, no clinical effects were noticed. The injections were made every third day, the cases carefully watched, and the temperature taken frequently. Owing to the absence of any apparent effects, treatment by bacterial extracts was discontinued after twenty injections owing to the material appearing inert. Treatment for wounds and ulcers in lepers by a 2 per cent. solution of iodine, which has been favourably spoken of, did not fulfil the expectations hoped for, although fairly satisfactory results obtained as a rule. The chief cause of death in the leper asylum was muco-enteritis, indicating a direct result of the lepra bacillus on the intestinal wall. Chaulmoogra oil, or its refined constituent, antileprol, is the remedy that dominates the therapeutic field so far as leprosy is concerned. The antileprol is preferable, as it causes less gastric disturbance than the unrefined oil when given by the mouth. The dose of antileprol given internally varies from 15 minims, and ten times that quantity can be taken daily. Antileprol may be injected intramuscularly in doses of 3-5 c.c., approximately 50-80 minims, repeated every three days, and the course continued for some five months. In the early muscular stage of leprosy a cultural extract prepared from the organism isolated by Kedrowsky has given fairly satisfactory results, but not in the advanced nodular forms.

The Pathogenicity of Nosema apis *to Insects other than Hive Bees.*—Fantham and Porter contribute a very interesting paper to the *Annals of Tropical Medicine and Parasitology* (Series T. M., vol. vii, No. 4, December 30, 1913), on *Nosema apis*, a micro-sporidian parasite of hive bees. Their researches show that this parasite may attack other insects as well as bees, the importance of this being evident.

Their conclusions give an excellent summary of the paper, and are as follows:—

(1) *Nosema apis* has been proved pathogenic to Hymenoptera other than bees. It can multiply in the food canals of humble bees, mason bees and wasps, and can bring about the deaths of the hosts.

(2) Contamination of plants with infected excrement occurs in the neighbourhood of badly infected hives. Such contaminated food is pathogenic to the larvæ of cabbage white butterflies, cinnabar moths and gooseberry moths, in which *Nosema apis* produces destruction of the tissue of the food canal in the same way as in bees. Both imagines and larvæ of these insects became infected with microsporidiosis when supplied with food contaminated with Nosema spores.

(3) *Calliphora erythrocephala*, the blow-fly, becomes infected naturally by ingesting Nosema spores contained in the sweet excrement of bees. This infection has been repeated experimentally. Crane-flies may also become infected.

(4) A member of the Hippoboscidæ, *Melophagus ovinus*, has been infected successfully with *Nosema apis*, which is pathogenic to the sheep ked. The authors suggest that research be made by competent observers among the Glossinæ for Microsporidian parasites allied to the Nosema of bees, and, possibly, equally pathogenic to the tsetse-flies that may harbour them.

Rat-bite Disease.—From time to time accounts of a febrile condition induced by the bite of a rat appear in the literature. It is an old story the evils that may possibly ensue on bites from rats, but it is only recently that the signs and symptoms have been systematically described. In 1899, H. Miyake described the disease in the *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, vol. v, No. 2, p. 231. In the *British Medical Journal*, 1912, part ii, p. 1437, Professor Cruickshank reports a case of the kind. Professor R. Tanner Hewlett and Dr. G. H. Rodman, in the *Practitioner* of July, 1913, relate a case of rat-bite disease which occurred in 1904. In the *Tropical Diseases Bulletin*, vol. i, 1913, No. 7, an excellent summary of what is known of this disease is given. The period of incubation of the disease is from five to eight weeks; during the incubation the wound caused by the bite gives little or no trouble and generally heals over. Invasion occurs with rigors followed by a febrile state, with marked intermissions, the temperature being up for three days, reaching a maximum of about 105°, followed by a three-days' interval, in which the tem-

perature is below the normal. An eruption in the form of an erythema is frequently present. The glands in direct association with the line of lymphatics leading from the seat of the bite get enlarged and a general glandular enlargement in axilla and groin may be found. In the case recorded by Hewlett and Rodman the patient recovered after a period of febrile and afebrile attacks lasting seventeen weeks.

The mortality is stated to be about 10 per cent. of those attacked, the later stages of the fatal form of the malady being associated with general œdema, albuminuria, and mental symptoms. Ogata states that he has found a protozoan parasite, but his observation has not been confirmed.

Balantidiasis.—Walker contributes an interesting paper upon "Experimental Balantidiasis" to the *Philippine Journal of Science*, vol. viii, Sec. B, No. 5, October, 1913. His summary and conclusions are as follows:—

(1) Parasitization of man with *Balantidium coli* is relatively common in the Philippine Islands.

(2) The balantidia appear in the stools of parasitized individuals only at irregular intervals, and consequently infections, unless accompanied by clinical symptoms, may frequently be overlooked.

(3) A large proportion of the pigs in and about Manila are parasitized with balantidia.

(4) Balantidia are passed in the resistant encysted stage more or less constantly in the stools of parasitized pigs.

(5) Morphologically *B. coli suis* is identical with *B. coli hominis.*

(6) Forty per cent. of five monkeys fed or injected with *B. coli hominis* became parasitized.

(7) Seventy and five-tenths per cent. of seventeen monkeys fed or injected rectally with *B. coli suis* became parasitized.

(8) Monkeys parasitized with either *B. coli hominis* or *B. coli suis* show the parasites in the stools only at infrequent intervals.

(9) Only a small proportion of the parasitized monkeys became infected. Of two monkeys parasitized with *B. coli hominis*, one, and of twelve monkeys parasitized with *B. coli suis*, one, showed the parasites in the tissues *post mortem.*

(10) The early lesions of the intestine of monkeys infected with *B. coli* consist only of a slight hyperæmia with or without punctiform hæmorrhages.

(11) Histological examination of the tissues of monkeys recently infected with *B. coli* show changes, notably vascular dilation, minute hæmorrhages, round-cell infiltration and eosinophilia, which distinguish them from lesions of bacterial origin.

(12) *B. coli* was never found entering the tissues through the lesions in ten parasitized monkeys having a colitis or ulcerations due to bacteria or other causes.

(13) In those monkeys in which infection took place, the balantidia entered the tissues through the sound intestinal epithelium.

(14) *B. coli* can produce bacteriologically sterile abscesses in the submucosa of an infected intestine.

(15) *B. coli* is the primary etiologic factor in the symptoms and lesions of balantidial dysentery.

(16) The latency prevalent in balantidiasis of man is due chiefly to the fact that the patient, although parasitized, is not infected with *B. coli*, but in part to the chronicity of the ulcerative process in infected cases.

(17) Every person parasitized with *B. coli* is liable sooner or later to develop balantidial dysentery.

(18) *B. coli suis* is identical with *B. coli hominis.*

(19) The domesticated pig is the chief source of infection in the balantidiasis prevalent in the Philippine Islands.

(20) Therefore, efficient prophylactic measures against balantidiasis in the Philippine Islands should be directed against these animals, which should be confined and not allowed to run in yards and dwellings.

Insect Transmission of Anthrax.—M. Bruin Mitzmain, Veterinary Entomologist, Government of the Philippines, records, in *Public Health Reports*, xxix, 2, for January 9, 1914, a preliminary note of a large number of experiments on the *rôle* of suctorial insects in the dissemination of anthrax. The experiments were tried with an artificially infected guinea-pig, which died of the disease upon the third day. The flies were applied two and a half hours to a few minutes before the death of the blood donor. Guinea-pigs were used to receive the infective bites of *Stomoxys calcitrans* and *Tabanus striatus.* Each animal was placed in a gauze sack strapped to an individual board and the flies were induced to feed when applied from separate test-tubes. *S. calcitrans* was used as the porter in two experiments and *T. striatus* in a single experiment. With both species the infection was successfully transferred by the direct method in which the flies were interrupted while feeding on the sick animal. The stable flies were transferred to the healthy animal in one trial with only a few seconds' interval after biting the infected host, and in the other instance an interval of ten minutes elapsed between the feedings. A total of twenty flies were used in the first experiment and thirty flies in the second trial.

The exposed animals died in both cases during the evening of the third day. Typical pictures of anthrax infection were presented at the necropsy of the two animals. In addition a substantial gelatinous and hæmorrhagic œdema was observed in the subcutaneous region of the area upon which the flies were applied in biting. The agar cultures when injected reproduced the disease with fatal results in guinea-pigs used in later experiments.

Similar results were obtained in all essentials when horse-flies were employed to transfer the disease from the sick to a healthy guinea-pig. Three flies were used to carry the infection, with only a few seconds' interval from infected to healthy host. The latter died on the fourth day after the flies

were applied. The autopsy was made a few minutes after death. As in the other instances, there was no rigor mortis. The site of fly-biting was not much involved; only a slight gelatinous hæmorrhagic œdema. The subcutaneous injection also was slight in effect. The spleen was greatly enlarged and extremely friable. Vigorous growth characteristic of the anthrax bacterium was obtained on agar, and later the disease was reproduced in a horse from a saline suspension of the agar culture. Typical organisms were seen in the fæces of horse-flies at various intervals up to forty-eight hours from the time the infected animal was bitten. The fæces of the stable-fly were likewise found to be infected up to twenty-four hours after obtaining blood from a sick animal.

A series of experiments is at present being conducted with anthrax in cattle and horses. Guinea-pigs or other rodents will in every instance be employed as blood donors, as experience has shown that it is difficult in large animals to time the probable invasion of the peripheral circulation by the anthrax organisms so as to render insect transmission practicable. An attempt will be made to determine the limits of infection in flies acting as carriers of contaminative material.

Drugs and Appliances.

THE following useful suggestions as to the care of hypodermic syringes and needles have been issued by Messrs. Parke, Davis and Co., London.

To test the syringe do not draw out the piston under a vacuum and allow it to recoil, as this will most probably result in fracture of the barrel. The best way is to draw out the piston, then place a finger firmly on the nozzle, and push the piston home as far as possible; on discontinuing the pressure the piston will recoil, provided the vacuum and syringe are satisfactory, without risk of breakage.

A safe and efficient test is to fill the syringe with water, then affix the needle and insert the point of the latter into a good cork; on pressing the piston it will soon be seen if the plungers and washers are satisfactory.

Syringes fitted with leather plungers and washers should not be sterilized by boiling, as this destroys resiliency of the leather. The syringe itself will seldom need sterilization, particularly if in frequent use, as many of the solutions employed are antiseptic. If it has been used to aspirate a cavity containing purulent matter, however, a germicidal solution should be drawn into and expelled from the instrument repeatedly; it should then be rinsed thoroughly with sterile water, filled with a 5 per cent. solution of carbolic acid or lysol, and laid aside for an hour, after which it should be rinsed repeatedly with sterile water.

Leather plungers and washers are liable to become hard and to fit imperfectly if neglected; they should be oiled occasionally, when dry, with an antiseptic oil. The plunger, if loose, may be tightened by drawing out the piston to its full length, so that the small nut on the upper end of the plunger engages in a socket in the cap of the syringe; the piston is then turned gently to the left—to loosen, turn to the right, The plunger should not be expanded more than is absolutely necessary, else it will not work smoothly, and the leather packing may be injured.

There should be no need to unscrew any part of the syringe except the needle and cap, or to remove the barrel or plungers.

Syringes fitted with rubber plungers and washers may be sterilized by boiling water or by steam, all parts being separated for the purpose. They may also be sterilized by carbolic acid or any such agent, in which case the syringe must be rinsed with sterile water before using with serums, otherwise the serum may become coagulated. For this reason also, syringes should be rinsed after use with serums before they are sterilized by any method.

Rubber packings become hard in course of time, but they can be replaced readily by unscrewing the top of the syringe, and replacing the old packing with a new one; see that the convex end of the packing fits well into the end of the small cup. The packing will last much longer if it is contracted when the syringe is not in use; this is accomplished by drawing the piston out to full length and turning it to the right, reversing the process before use. If any lubricant is considered desirable, a little glycerine should be employed, not oil.

Physicians who have become accustomed to leather-packed syringes may disapprove of the rubber packing if the difference in action is not taken into account. Dry rubber clings to dry glass, so that the piston does not then work smoothly; but when wet no difficulty is experienced. To test these syringes, adopt the second method suggested in the general rules above. The packing, being cone-shaped, allows air to pass it readily; but when the syringe is filled with fluid it will be found practically impossible to force this past the packing. Fill the syringe very slowly, preferably by means of the filling needle supplied with the serum syringes.

All-metal syringes—i.e., syringes without leather or rubber plungers and washers—may be sterilized most satisfactorily by boiling, the syringe being taken apart for the purpose. Afterwards the metal plunger should be lubricated with a little antiseptic oil.

It is most essential that these syringes, after each using, should be rinsed free from any sediment or unexpelled fluid; also care should be taken to prevent any foreign matter finding its way into the barrel, as such is liable to fix the plunger, and may render the syringe permanently useless. If the plunger is not kept apart from the barrel, when not in use, it should be smeared with a little glycerine to prevent fixation.

The all-glass syringes may be sterilized by boiling; they must be taken to pieces and placed in cold or warm water, then heated to boiling point, and kept at this temperature for five minutes. Sufficient water to cover the syringe must be maintained in the vessel. Before the parts are fitted together after sterilization,

each section should be dried thoroughly. Lubrication is unnecessary.

Great care should be exercised to cleanse the all-glass syringe after use; the parts must be separated, and each rinsed thoroughly in cold water, and, preferably, with alcohol afterwards. The neglect of these precautions is almost certain to result in inconvenience.

It is desirable that the plunger should be kept apart from the barrel when not in use, and most of the cases in which these syringes are supplied are provided with separate springs or spaces for this purpose; when this is not done, the plunger should be smeared with a little glycerine to prevent fixation. The syringe should never be held perpendicularly without holding the piston, as the weight of the latter is, in itself, sufficient to expel the fluid. A combined finger-grip and stop is supplied, by means of which the piston is prevented from dropping out of the barrel, and a better control of the syringe is afforded.

The serum syringes are supplied with a filling needle, in addition to the ordinary needles. The use of this will greatly facilitate the filling process, especially from bulbs of vaccine or serum, and will obviate the risk of blunting the ordinary needles.

All needles should be sterilized before and after use, either by boiling or by heating in a flame; the latter process, however, tends to destroy the temper of steel needles. After use the needle should be cleared of every drop of fluid by forcing air through it from the empty syringe.

To prevent needles becoming rusty and clogged whilst not in use, they should (subsequent to sterilization) be wiped with a piece of wool or lint saturated with an antiseptic oil, and a greased wire should be inserted in the bore of the needle, and kept there until it is required for use.

Reviews.

HEALTH PRESERVATION IN WEST AFRICA. By J. Charles Ryan, L.R.C.P.I., L.M., L.R.C.S.I., L.M., late M.O. West African Medical Staff; with an Introduction by Sir Ronald Ross, K.C.B. London: Bale, Sons and Danielsson, Ltd. 1914. Price 5s. net.

Many books have been written on health in the Tropics, and in West Africa in particular. The present manual is in all respects up-to-date. The rapid commercial and Government development requires a practical account of health matters. Despite much improvement, West Africa is, and from the nature of things must always be, a most unhealthy country for the white race. But a healthy man who makes up his mind to pay detailed attention to preventive measures against ill-health, in spite of the trouble this may cause him, will be amply rewarded in being better able to fulfil the conditions of his employment. The watchword of the book is "Attend to details."

OUTLINES OF GREEK AND ROMAN MEDICINE. By James Sands Elliott, M.D., Ch.B.Edin., Editor of the *New Zealand Medical Journal*. Illustrated. London: Bale, Sons and Danielsson, Ltd. 1914. Pp. 165 + xii. Price 7s. 6d. net.

This work appeals to doctors, to medical students, pharmacists and others who are interested in the history of the progress of human thought and knowledge, and who realize that the investigation of the body and mind, in health and disease, has been one of the most important features of the evolution of humanity.

Everyone is acquainted with various items of the history of medicine, but few have a comprehensive knowledge of the story of their art. Without such a knowledge to bind together the consecutive events science cannot really come into its kingdom.

The book commences with early mythological Roman history, then goes on to early mythological Greek medicine, and next describes the commencement of the earliest records of medicine. The various modes of thought and clinical descriptions of disease and treatment by drugs, baths, and exercises, are given in interesting detail.

Coming to the time of full and authentic records, the origin, progress, and decline of the various philosophical schools of thought are explained; their results on practical medicine and the lives of the public being graphically dealt with.

Not least interesting is the connection at various periods of the physicians, surgeons, and specialists, the relations between medicine and religion, and the points at which they coincide and diverge. A special chapter is devoted to the "Influence of Christianity on Altruism and the Healing Art." The death of Galen marks the beginning of the decline of medical science in ancient times, and this we can well understand when we are told that he regarded his work as "a religious hymn in honour of his Creator, who has given proof of His omnipotence in creating everything perfectly conformable to its destination."

What we conceive would be most interesting to our readers is the progress of the primitive mind of man in matters relating to health, which explains many facts in folk-lore, and accounts for views held both abroad and at home.

An excellent index facilitates reference; the book is light to handle, the print is good, and the whole worthy of an author from "down-under" and a London publisher.

SCROFULOSIS. By Professor Dr. G. Cornet, Berlin and Reichenhall. Translated from the second German Edition by J. E. Bullock, M.D., Assistant Medical Officer, The Eversfield Chest Hospital, St. Leonards-on-Sea. London: Bale, Sons and Danielsson, Ltd. 1914. Pp. 515 + xiii. Price 15s. net.

This is a translation of one of the series of the German Tuberculosis Classics, issued on the advice and under the direction of Egbert Morland, M.D., B.Sc.

The book commences with a historical survey, beginning with the derivation of the word scrofula as known to the Latins and Greeks. According to Virchow, it signifies a young pig, from the resemblance which the neck, enlarged by the swollen glands and forming a continuous outline with the lower jaws and shoulders, bears to the full contour of the pig's neck.

Various views are given of clinical conditions, which are embraced within the term scrofulosis, and may be paraphrased as an independent disease due to a certain predisposition, that in its course often presents tuberculous complications.

The book describes all possible pre-tubercular conditions and other causes of ill-health, particularly those affecting the lymphatic glands.

Having discussed heredity, social, and other factors which favour infection, morbid anatomy is then dealt with.

The third section of the book, from p. 180 to p. 218, deals with symptoms in the skin, in the mucous membranes of the nose, mouth and pharynx, ear, eye, and other mucous membranes, showing how morbid processes may originate in them and become differentiated.

The third group of symptoms relates to the lymphatic glands, the external ones of the neck, groin, and armpit, and then the bronchial and mesenteric glands.

After due consideration of bone and joint affections the general symptoms are discussed.

The fourth section describes the course and duration of scrofulosis and tuberculous scrofulosis, as well as mixed infection.

A special section is devoted to prognosis, followed by one on diagnosis, both clinical and laboratory.

About 250 pages are well spent in consideration of prophylaxis, therapeutics, including open-air, medicinal, and local treatment of the skin, mucous membranes, respiratory organs, ear, eye, affections of the glands, bones, and joints.

A detailed bibliography occupies 74 pages, followed by an index, as well as separate index of authors.

Notes and News.

WU LIEN TEH HONOURED.

WU LIEN TEH (G. L. Tuck), M.A., M.D.Cantab., the Director of the North Manchurian Plague Prevention Service, has had the honour of being granted the Chia Ho (third class) Decoration. This is the highest rank ever conferred upon a medical man by the Government of China; the Chia Ho Decoration ranks with those conferred on the heads of departments in the Chinese Foreign Office, to which Dr. Wu Lien Teh is the Medical Officer. Dr. Wu, better known in this country by his adopted name of G. L. Tuck, took a prominent part in the Tropical Section of the International Medical Congress in London in August, 1913, and gave an interetsing and comprehensive account of plague in Manchuria and of the part presumed to be played in the spread of the disease by the tarbagan.

We congratulate Dr. Wu Lien-teh upon the well deserved honour bestowed upon him, and it augurs well for the future of modern medicine in China that the Government recognize the important position Medicine and Hygiene occupies in the welfare of the State.

AUSTRALASIAN MEDICAL CONGRESS, AUCKLAND, NEW ZEALAND, 1914.

MESSRS. BURROUGHS WELLCOME AND CO. have an interesting display of medicinal preparations and surgical requisites on view in connection with this Congress.

Among the most recent results of this firm's experimental work is "Epinine," which possesses the therapeutic effect (active principle) of the supra-renal gland, is a synthetic preparation, and not only exercises a more sustained effect than the natural active principle but retains its activity longer. There are, further, "Ernutin," a clear palatable fluid, containing the active principle of ergot of rye; and "Vaporole" "Infundin," an extract of the infundibular substance of the pituitary gland. The respective actions of these three products on living organisms are indicated by kymographic tracings.

A "Tabloid" case of medical equipments, a "Soloid" Bacteriological Case, a Blood Test Case, a Water Analysis Case, "Wellcome" Sera, Vaccines and Tuberculins, and the "Tabloid" animal substance products were also on view.

The "Tabloid" Adjustable Head Dressing, "Tabloid" Bismuth Gauze, non-toxic and inodorous, as well as a series of beautiful photographs illustrating the cultivation of medicinal plants on the "Wellcome" Materia Medica Farm, Dartford, render this display wonderfully complete and interesting.

Personal Note.

Dr. H. B. Dodds, Medical Officer of St. Vincent, has been transferred to the service of the Straits Settlements as a Medical Officer of that Colony. Mr. Dodds left St. Vincent on the 24th ult. for England, and will be on half-pay leave from that Colony until the 31st inst.

Notices to Correspondents.

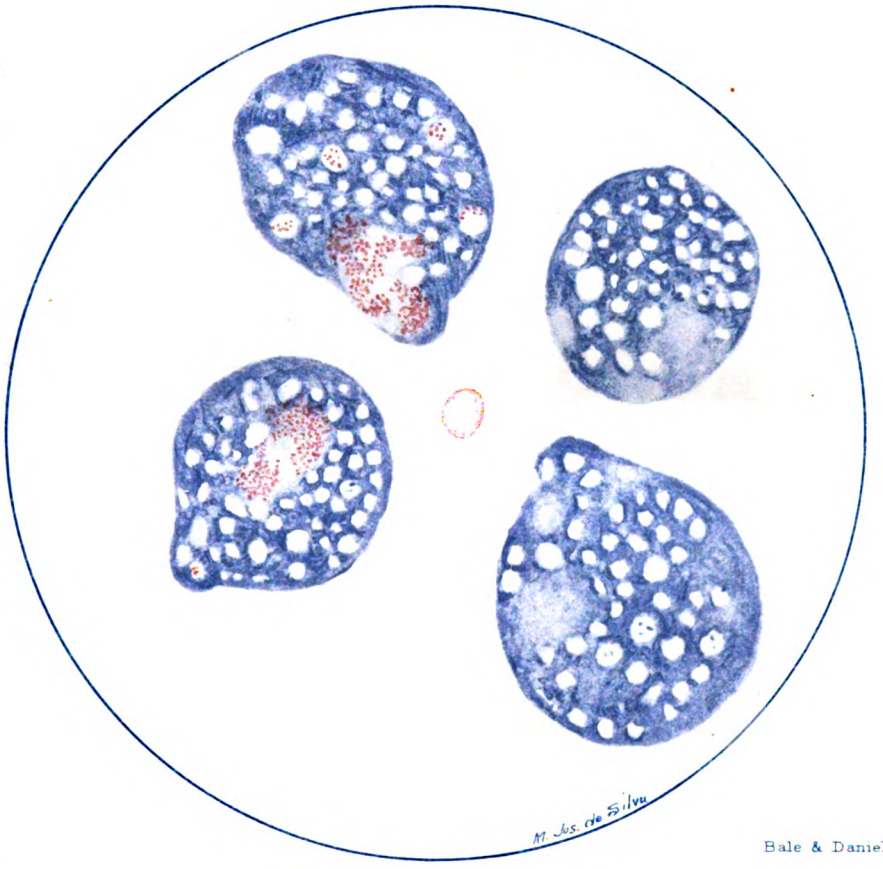
1.—Manuscripts if not accepted will be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

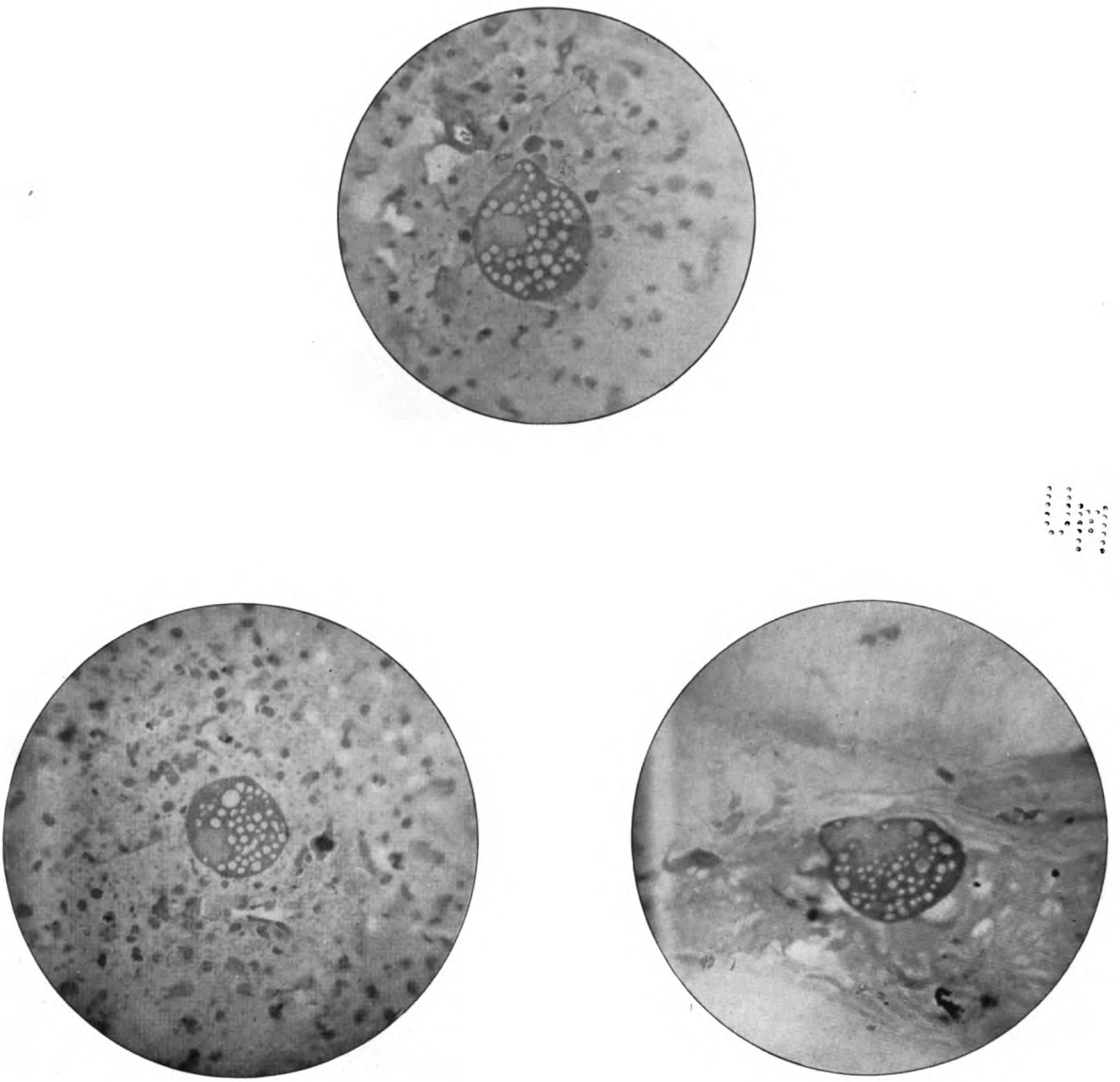
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Bale & Danielsson, Ltd

From a film stained by Giemsa's method.

To illustrate article by ALDO CASTELLANI, M.D.,
"Note on an Intestinal Protozoal Parasite producing Dysenteric Symptoms in Man."



Microphotographs of the Parasite from a preparation stained with Giemsa.

To illustrate a "Note on an Intestinal Protozoal Parasite producing Dysenteric Symptoms in Man," by ALDO CASTELLANI, M.D.



Original Communication.

NOTE ON AN INTESTINAL PROTOZOAL PARASITE PRODUCING DYSENTERIC SYMPTOMS IN MAN.

By ALDO CASTELLANI, M.D.

Director, Government Clinic for Tropical Diseases, Colombo, Ceylon.

IN three cases of mine in Ceylon presenting dysenteric symptoms I have observed a peculiar large protozoal parasite which most probably was the cause of the condition. The first case occurred in 1909, but as stained preparations of the parasite were not successful I did not publish the observation in detail, though I briefly mentioned it in certain of my papers on intestinal diseases.

Symptoms.—In all the three cases the clinical symptoms were those of an ordinary mild type of dysentery, either amœbic or bacterial. The onset was rather abrupt with severe abdominal pain, tenesmus and diarrhœa, with stools containing muco-pus and blood. The motions soon lost any trace of fæcal matter and consisted only of muco-pus and blood. In all cases the microscopic examination showed absence of löschiæ, cercomonata, trichomonata, balantidia and ova of worms; instead several large motile parasitic bodies were seen, which will be described presently.

The general condition of the patients was never very serious. Fever was present at the onset in Cases 2 and 3, but did not exceed 101° F., and lasted only a day or two. The dysenteric symptoms disappeared very quickly after a few doses of saline mixture or castor oil. Complications were not observed except in Case 3, in which slight signs of hepatitis were present, but rapidly disappeared. Relapses may occur, apparently, as shown by Case 3.

Case 1.—Cingalese man. Admitted to the Clinic for Tropical Diseases in January, 1909, suffering from an epiphytic skin disease. After four days in the clinic, during which time he received no treatment of any kind, he one morning was taken ill with very severe abdominal pains, with muco-pus and blood in the stools. The stools were examined microscopically, and large bodies were seen which I believe to have been absolutely identical with those found later in Cases 2 and 3 presently to be described. Two films were made, but unfortunately the staining by Giemsa's was not successful. A dose of castor oil stopped all dysenteric symptoms the same day, and in the stools which were passed later no bodies were found.

Case 2.—European passenger. Had lived in Southern India and Burma for several years. While in Colombo (April, 1913) on his way to England was taken ill with dysenteric symptoms at one of the hotels. When I saw him the temperature was 101° F.; he complained of nausea and of very severe abdominal pains with severe straining. The motions contained blood and muco-pus and the microscopic examination showed the bodies (to be presently described) in fresh and stained preparations. No löschiæ were present, nor trichomonata or cercomonata. Two emetine injections (⅓ gr. each) were given, and also every two hours a sodium sulphate and magnesium sulphate mixture (1 dr. of each per dose). The motions became fæculent after a few hours, and the bodies were no longer present.

Case 3.—European officer of the Mercantile Marine. Admitted to the General Hospital of Colombo with dysenteric symptoms. Gave a history of two previous attacks of dysentery in Rangoon and Bombay. Temperature on admission 100° F., pulse 90; the patient complained of severe abdominal pains and tenesmus with bloody stools for three days, also of severe pain in the hepatic region. The tongue was coated. Examination of the chest revealed nothing abnormal. Palpation of the abdomen induced pain, especially on the sigmoid region and hepatic region. The liver was slightly enlarged and tender, spleen normal. The usual sodium sulphate and magnesium sulphate mixture was given and within twenty-four hours the stools became fæculent. Before starting the mixture the stools contained many bodies identical to those of Cases 1 and 2. They quickly disappeared after a few doses of the mixture, even before the stools had become fæculent. No amœbæ were present at any time, nor trichomonata nor cercomonata. The bacteriological examination of the stools for bacilli of the dysentery group gave a negative result.

DESCRIPTION OF THE PARASITE.

Fresh Preparations.—In fresh preparations and hanging drops of the stools, one sees large, rather elongated motile bodies, which on a superficial examination give the impression of being very large flagellates moving about. On close examination, however, no flagella can be detected. The parasitic bodies are large, elongated or oval; one extremity, the one which in stained preparations appears mammillary, is, so to speak, shaken by a peculiar, extremely frequent, vibrating movement, which makes one suspect the presence of flagella or an undulating membrane or cilia. Neither in fresh preparations nor in stained preparations have I been able to detect flagella or cilia. The protoplasm has the same appearance all over the body of the parasite, presenting numerous roundish vacuoles, none of which are contractile. No distinct nucleus is evident, and there is apparently no distinct differentiation between ectoplasm and endoplasm. The parasite does not emit pseudopoda like an amœba, in fact, the changes in shape of the body of the parasite are slight, and very similar to those slight changes in the shape as found in flagellates, such as *Trichomonas hominis.*

Motility.—The parasites move about fairly rapidly, though not so quickly as cercomonata or trichomonata; how motility is produced it is difficult

to say. No pseudopoda are protruded and the body of the parasite shows only slight changes in shape. The anterior portion, as already stated, shows extremely rapid vibratory movements, but no flagella nor cilia are seen, nor, apparently, a definite undulating membrane, nor have I been able to satisfy myself that there is emission of filiform pseudopoda.

Stained Preparations.—All my preparations were stained with Giemsa and Leishman. The typical parasites have a peculiar flask-like appearance (see microphotograph), but round forms are also found; the maximum diameter varies between 45 and 55 microns. The protoplasm is stained blue and presents numerous non-stained roundish vacuoles regularly distributed all over. In certain parasites a large mass of chromatoid roundish granules are seen, but in others it is absent. The granules have the appearance of cocci; but probably they are chromatine granules representing a diffuse nucleus. In one specimen the chromatine granules were bacillary in shape. In none of the bodies were flagella seen nor cilia, nor any evidence of any undulating membrane. Of course, it is possible that by using special methods, in place of Giemsa or Leishman, such structures may possibly be put in evidence.

Reproduction.—I am not yet in a position to state anything on this subject.

Cultivation.—Attempts at cultivation have failed.

Zoological Position of the Parasite.—As I have already stated, in fresh preparations, the first impression on seeing these large bodies moving about, and with an extremity presenting rapid, vibratory-like movements, is that one has to do with flagellates with the flagelli at one end, but on closer examination no flagella are ever seen either in fresh or stained preparations. The parasite, therefore, apparently is not a flagellate. It cannot, in my opinion, be placed in any of the genera *Löschia*, *Entamœba*, *Vahlkamfia*, *Paramœba*, as pseudopoda are not protruded, and the changes in the shape of the parasite while moving are slight. It cannot belong to the genus *Chlamydophrys*, as there is no shell. It cannot belong to the genus *Colpoda*, *Uronema*, *Nyctotherus*, *Balantidium*, as cilia, at least in fresh specimens and in preparations stained with Giemsa and Leishman, are not evident. I am inclined to consider the parasite to represent a new genus and species, and as a temporary generic term I have suggested the term "*entoplasma*."

I wish to express my indebtedness to Dr. Fernando, First House Physician to the General Hospital, and to Mr. E. Burgess, Assistant Bacteriologist, for much assistance rendered, and to Mr. M. J. de Silva for the microphotographs and drawings.

REFERENCE.

CASTELLANI: "Preliminary Note on an Intestinal Protozoal Parasite," *Journal Ceylon Branch B.M.A.*, May, 1913.

[Owing to the proofs not having been returned from Ceylon, this paper has unfortunately been held over till the present date.]

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THE JOURNAL OF

Tropical Medicine and Hygiene

MARCH 2, 1914.

THE NECESSITY FOR A WOMEN'S INDIAN MEDICAL SERVICE.

ATTENTION has lately been drawn by Sir Charles Pardey Lukis, Director-General, Indian Medical Service, to the need of fully-trained medical women in India. His clear exposition of the domestic life peculiar to the native households of that country makes it evident that by women doctors, and women doctors alone, can we hope to raise the people of India from the prejudice against innovations, the superstitions which encumber every attempt at sanitary enlightenment, and the suspicion with which all European methods of procedure in matters of public health are regarded.

House to house visitation and conversations in the language or dialect peculiar to a district with

the women of the household will do more to bring about sanitary improvements than by official circulars which they cannot read, or by edicts which they cannot understand. Teaching the young in schools will help no doubt; but school instruction, whether at home or in India, is one thing, the life and customs of the home are quite another. Just as the language used in school, church, or theatre in Britain is that of English more or less "pure" in type, whilst the language of the home is a dialect, so is public instruction in matters of health to those which use and wont have set up in the environment of the home. The knowledge must be implanted at the source, namely, the home, and as here the mother is supreme, it is only by instructing her that permanent and immediate good can be brought about. This endeavour would imply an army of women doctors amounting to many thousands in number, and the question is: can sufficient instructors be found? We have in England many schools in which women are trained as doctors, but the numbers are not markedly increasing; in fact, in many schools the number of women medical students is diminishing. Supply and demand control the medical output of doctors just as the same principle holds good in every profession or commercial pursuit. The demand for women doctors at home is not calculated to stimulate women selecting medicine as a livelihood; for the course is strenuous and the expense heavy, yet would these be cheerfully overcome were a sure prospect of employment held out as an inducement. Sir Charles Lukis shows where women graduates in medicine can find employment, where they can do work for the Empire, and where their work would be appreciated to the full.

Indian custom forbids to women the freedom granted to them in Britain of having male doctors to enter their homes for the purpose of treating them when sick, or even for the purpose of conversing with them on sanitary matters. To women doctors, however, is the privilege granted, and it is through this channel alone that improvement in the public health of India can be hoped for. It lies with the Government of India to undertake this great work. There are rumours abroad that changes of a radical kind are entertained in the greatest medical public service of our Empire, namely, the Indian Medical Service. Those who know even something of this service know how efficiently the work has been done hitherto; but times change, and modern India demands changes to fit the times. What these changes may ultimately result in is known to but few, or it may be that no scheme has been as yet fully thought out, but whatever is done it is hoped that the necessity for fully-trained medical women may be considered, and that an Indian Medical Service for women may be placed upon a satisfactory basis. Many British women in India are at present doing excellent work as doctors, nurses, and as missionaries, but the work must be systematized, the empirical efforts now in vogue must be organized, and a great women's public sanitary service be made a department of the Indian Medical Service. Should the medical and sanitary service be divided as some contemplate, it should be seen to that no third service, namely, one for women under a separate command, be set up, otherwise there will be overlapping, friction, and discontent. The necessity is immediate; the opportunity for development is well-nigh limitless, for until the three hundred millions of India are provided for there should be no halt.

In Britain schools for mothers are rapidly multiplying; motherhood is a "calling" which the modern world is only beginning to realize; the rearing of children is the foremost duty of the woman; the continuance of the species is the primary object of every living thing. In Britain it is found that, late as the age of marriage is compared with the early age at which women become mothers in India, ignorance prevails to an extent which seems inexplicable. If, then, training of mature women in Britain is necessary, how much more so is the case in India, where girls of 15 or 16 become mothers? The child suffers, the mother suffers; infant mortality is high, and the dangers of childbirth are manifold. Primitive methods of midwifery are almost universally in vogue, and it is evident that, as teachers of native midwives, women doctors would be serving a great humanitarian purpose.

Under the Dufferin Association a great work has been accomplished, and the Indian Government has acted wisely and generously in the recent grant of £10,000 to the Association. We should like to see the work of the Association extended, and the service of medical women organized and developed into a great public service worthy of the Empire and sufficient for the needs of India.

Attention has lately been called to a peculiar feature in the numerical relations of the sexes in India. It is stated that the men outnumber the women in many areas. This statement is at variance with that observed in all the older countries, and especially perhaps in Britain, that the announcement is astonishing rather. We know that there are more boys born in this country than there are girls, but soon the excess disappears, and in adult years the women outnumber the men by something like two millions. We can account for it by the fact that for one woman leaving the country twenty men go abroad; but in India, although a certain number of men do go abroad, yet does the male population exceed the female. It is stated that the Chinese drown a certain number of the female infants; improbable as this assertion is, especially in a country where polygamy prevails, yet it suggests an excess of females over males born. The cause of the disproportion in India may be due to the number of deaths which occur at childbirth; it is known that this number is large, and if it is due to this cause there is surely a "white woman's burden" imposed, and the women of Britain should take up this burden and help their sisters in India in their extremity.

J. C.

Annotations.

The Treatment of Infantile Diarrhœa by Saline Injections.—In the *Practitioner* of July, 1913, Professor H. B. Day, of Cairo, gives his experience of the treatment of infantile diarrhœa by subcutaneous injections of diluted sea-water, termed marine plasma. The solutions used in the treatment are: (1) Quinton's marine plasma, which consists of sea-water collected in sterilized vessels at a sufficient depth and distance from land to ensure purity, is diluted with sterilized distilled water to make an isotonic solution. (2) Sea-water, 3 parts to 7 parts filtered distilled water, put up in sterilized bottles, and heated in an autoclave to ensure sterility. (3) Ringer's solution is the best artificial saline. The composition of an artificial saline in grains—when figures are "rounded off"—consists of:—

Sodium chloride	229	gr.
Mag. chloride	25¾	,,
Potass. chloride	8¾	,,
Mag. sulph.	13	,,
Calcium sulphate	8¾	,,
Distilled water to 1 pint.		

The injections are given with the ordinary precautions, and the best place for introducing the needle is the side of the abdomen, but they can be given anywhere; in the back if the child is obstreperous. The quantity given as a rule averages 60 c.c. (about 2⅛ oz.), but the amount varies from 25 to 150 c.c. (approximately 6⅔ dr. to 5¼ oz.). The amount given at a time depends on the rate of absorption, which is judged by the speed with which the lump formed by the fluid is dispersed.

In cases of moderate severity one injection a day may suffice, but where the circulation is failing large quantities may be given two or three times a day.

Results.

Method of Treatment	Numbers successful	Failures	Recovered Per cent.
(1) Alexandrian sea-water with medicines	130 ...	30 ...	81·25
(2) Alexandrian sea-water only	44 ...	10 ...	81·5
(3) Quinton's sea-water ...	84 ...	12 ...	87·5
(4) Artificial (Ringer's) ...	62 ...	11 ...	85·0
(5) Medicine only	58 ...	3 ...	95·1

Medicine only seems to give better results than any form of saline.

When vomiting is present and medicines cannot therefore be retained, treatment by hypodermic injections are a useful stand-by.

To allay the vomiting a dilute solution of iodine (tinct. iodi. iii minims; aqua 1 oz.) proved successful, a small teaspoonful being given before each feed.

The most useful drug was found to be calomel combined with bismuth (calomel ⅙ gr., bismuth carb. 2½ gr.), which gave better results than hydrarg. c. creta. In addition to the powders, a little carminative mixture was given, with the addition of rum if the child showed signs of collapse. In several such cases injections were urged, but refused; these recovered on medicinal treatment.

When the presence of mucus and blood in the stools showed the large intestine to be chiefly involved, salines (sod. sulphat. or phosphat.) were prescribed with success. The addition of a little tinct. opii in bad cases was beneficial.

It would appear from the report by Professor Day that saline injections alone, without drugs, are capable of curing most cases of infantile diarrhœa.

Quinton's marine plasma has no definite superiority over artificial saline of the same strength. Such hypertonic solutions are preferable to weaker (·75 per cent. or less).

The administration of medicine is preferable to injections of saline as a routine treatment of infantile diarrhœa.

Disregard of dietary instructions is the commonest cause of failure of out-patient treatment.

Injections are valuable in proportion as the loss of fluid—by vomiting and diarrhœa—exceeds the intake. They should be given before actual symptoms of collapse arise.

The sum and substance of the treatment of diarrhœa by sea-water hypodermic injections is useful in so far as it replenishes the drain of fluid made upon the system by the diarrhœa.

Kala-azar in Malta, with some Remarks on the various Leishmaniases.—This was the title of a paper read by Dr. C. M. Wenyon before the meeting of the Society of Tropical Medicine and Hygiene on Friday, December 19, 1913. The paper was based on investigations which had been undertaken by the author in Malta during the summer of 1913. Kala-azar in the infantile form was first shown to exist in Malta in the year 1910 by Dr. Critien, who in a valuable report pointed out that the disease had long been known in the island under the name of *marda tal biccia*. It was Dr. Critien also who discovered that dogs in this island were liable to suffer from a form of leishmaniasis which is most probably caused by the same organism as that producing the infantile disease. The disease had, of course, previously been discovered in both children and dogs in other parts of the Mediterranean.

The author's results in Malta during the past summer are mostly confirmatory of Dr. Critien's findings, and it would appear that kala-azar is quite a common disease in children in this group of islands. Though this is a fact the disease is not recognized officially chiefly because of the difficulty in making an absolutely certain diagnosis without the actual finding of leishmania, which is only done easily by performing liver or spleen puncture, an operation which the general practitioner, for various reasons, is not anxious to undertake. As a result of this it has been the custom to return all cases of enlarged spleen in children under various names—splenic anæmia, Banti's disease, &c. In Malta malaria does not exist, so that the chief cause of error in the diagnosis of kala-azar is removed. It results, therefore, that practically all cases of splenic enlargement in children accompanied by emaciation, anæmia and fever, in this group of islands are in reality kala-azar. Six such

cases were seen by the author, and in five of these spleen puncture was performed and leishmania discovered in each case. The sixth case was one of twins, the other of which was shown by puncture to be a case of kala-azar, so there is no doubt that the sixth case was also one of the disease. Thus of six suspected cases all turned out actually to be kala-azar. In making returns of disease in the island a far greater degree of accuracy would be attained by returning as such all cases which conformed clinically to kala-azar. Dr. Critien has shown that during the ten years 1899 to 1908, 744 children under 5 years and 41 above this age died of diseases which were probably in reality kala-azar.

As regards the question as to whether the Indian and Mediterranean types of kala-azar are identical or not it was pointed out that though kala-azar in the Mediterranean districts chiefly attacked children, this is by no means always the case, as adults occasionally suffer from the disease. Again, since the first discovery of kala-azar in North Africa, Italy, Sicily, Greece, Malta, and other parts of the Mediterranean, this Western endemic centre is gradually being linked up with that of India. Quite recently cases in both children and adults have been described by Gurko from the Caucasus region of South-east Russia. Further East cases in children and adults have been recorded from Tashkent, so that there seems to be every probability that with further discovery the endemic centres of India will be linked up with that of Southern Europe. The disease also exists in both children and adults in Northern China, and here, again, it is conceivable that connecting centres will eventually be discovered uniting this focus with those of India and Europe.

It has been suggested that kala-azar has existed in Greece in ancient times, and it may be that the disease has spread from an original European centre, and this might account for the fact that in the original centre infantile cases form a greater percentage of the total than they do in more recently established centres farther east. There is some analogy in the subject of malaria, for it is well known that in those countries in which malaria has long been prevalent the children of the native population form by far the greatest percentage of cases, while the adult population enjoy a relative immunity. The introduction of malaria into a hitherto uninfected district, or the introduction of non-immunes into one already infected, leads at once to a great increase in the percentage of adult cases. Such may be the case with kala-azar, and the difference in the percentages of adult and infantile cases may vary with the length of time the disease has existed in any locality. In India, the fact that the disease spread up the valley of the Brahmapootra in epidemic form, largely amongst the adult population, a few years ago, may be an indication of its more recent introduction.

A difference appears to exist in that in the Mediterranean districts dogs are liable to kala-azar, whereas most prolonged search in the Indian endemic centres has failed to reveal the natural canine disease. In Colombo, Castellani claims to have found leishmania in dogs, but as he suggests that the dogs may have been imported dogs (presumably from some canine kala-azar centre) it is evident that he himself doubts whether the native dogs suffer from the disease as they do in the Western centres of infantile kala-azar. Castellani's claim is all the more remarkable in that Colombo is not an endemic centre for human kala-azar.

It was thought for some time that dogs could not be infected with the virus of Indian kala-azar, though it had been repeatedly shown that they could be infected with the leishmania from Mediterranean kala-azar. Quite recently Donovan and Patton have successfully inoculated dogs with Indian kala-azar virus, and at the Albert Dock Hospital the author has successfully inoculated an English dog with leishmania from the spleen of an Indian case which died in the hospital. Therefore, since we know that dogs can be infected experimentally with virus, both from Indian and Mediterranean cases, this supposed difference no longer exists. If then we have regard to the symptomatology, morphology of the parasite, infection of animals and distribution of the disease, it can hardly any longer be maintained that kala-azar as it exists in India is a disease different from that in other localities in China, Europe, Africa, and even South America, from which the first case of kala-azar has recently been described.

On the subject of the etiology of the disease, it was pointed out that Basile had claimed to have transmitted kala-azar from dog to dog by means of fleas. A similar experiment had been conducted by the Sergents, L'Heritier and Lemaire, who fed fleas, first on an infected dog and then on a dog which was previously tested for leishmania by liver puncture. The dog became ill but eventually recovered. It was killed and leishmania were found in the spleen and marrow but not in the liver. As liver puncture had been done to prove it free from leishmania before experiment, it may have been that even then the spleen and marrow were infected. Realizing these fallacies the author conducted an experiment in Malta with dogs sent out from India. The experiment was described in these words :—

" Realizing these fallacies, I attempted to conduct an experiment in Malta in which they were eliminated. I had four young dogs sent out from England, and at once upon arrival they were removed to the roof of the public health laboratories, where two of them were enclosed in a mosquito-proof cage and two in an unprotected cage about 15 yards distant. Over 300 fleas were captured from a dog known to be infected with leishmania, and these were transferred to the two dogs in the protected cage. After about three weeks the two dogs on which the fleas had been placed were showing signs of illness. From this date they became more and more anæmic and emaciated, and eventually, between five and six weeks after the commencement of the experiment, both dogs died within a few days of one another. It was found that the fleas first introduced had multiplied enormously, so that the dogs were covered with them. *Post mortem*, all the organs were anæmic and the spleens

small and very pale in colour, and quite different in appearance from the spleens of dogs suffering from kala-azar. A careful examination of smears of the liver, spleen and bone marrow failed to reveal any leishmania, nor did any flagellates develop in tubes of N.N.N. medium inoculated from these organs. It was thus fairly evident that the dogs had not died of kala-azar, but from the condition of profound anæmia produced by the thousands of fleas which infested them. The two control dogs in the neighbouring cage remained perfectly healthy. This experiment—which had every chance of succeeding—has proved a negative one, and thus lends no support to the flea transmission hypothesis."

The flea transmission hypothesis was examined by the author from another point of view.

It has been claimed by Basile, Alvarez, and others who have investigated this question, that fleas taken from kala-azar dogs are much more liable to a flagellate infection of the gut than are fleas taken from healthy dogs. Now, if this be true, there would be a great probability that the flagellates—in some, at any rate—of the fleas taken off the kala-azar dogs were developed from leishmania taken up from the blood of the dog. It is well known that flagellates almost, if not quite, indistinguishable from cultural forms of leishmania exist in fleas in countries in which canine kala-azar does not occur, so that in kala-azar countries this same flagellate would be expected to exist also. But the claim is that fleas are much more likely to be infected if taken off kala-azar dogs, so that it might be assumed that in a batch of fleas taken off an infected dog some would harbour a flagellate identical with that found in fleas in other countries, while some would harbour another flagellate—perhaps morphologically inseparable from the former—which had its origin in the leishmania with which the dog was infected.

To test this point, the author carried out a careful dissection of fleas taken off healthy and infected dogs, with a result quite the reverse of that claimed by other observers. Of a series of 274 fleas taken off dogs, the spleens and livers of which were examined *post mortem* and found to be free from leishmania, 23 were found to harbour flagellates in the hind gut; while of 200 fleas off dogs which were known to harbour leishmania, only nine were infected with flagellates. In this series, therefore, it happens that the percentage of fleas infected off apparently healthy dogs was twice as great as the percentage of fleas off dogs known to be suffering from kala-azar; there is, therefore, no evidence that any of these flagellates were derived from the leishmania, and it only serves to prove how irregular is this flagellate infection of fleas. Had the results been the reverse of what they were, it would have been very easy to fall into the error of concluding that the excess of infections was due to the fleas having taken up leishmania from the dogs.

That the leishmania are not themselves very resistant is shown by the following experiments made by the author. As has already been pointed out, fleas may be naturally infected with a flagellate which is hardly to be distinguished from the various forms of leishmania. In the flea, infection is produced by the larval fleas feeding upon the fæces of infected adult fleas. In this flea fæces, which consists of partly digested blood, there are passed numbers of small bodies which are very like the leishmania found in kala-azar. It is these small leishmania forms which produce infection when ingested by the larval flea. Some of this flea fæces was collected on sterile cover glasses and spread into a thin film and allowed to dry. It was found that even after twenty-four hours drying, a culture of flagellates could be obtained by dropping the cover glass into N.N.N. medium, thus proving that the small leishmania forms passed in the flea fæces will withstand a considerable amount of desiccation. This experiment was repeated with the spleen of a kala-azar dog, but it was found that the leishmania in the spleen would withstand no drying whatever, as no culture could be obtained on N.N.N. medium after drying the spleen smears. The leishmania as they occur in the tissues of vertebrates are much less resistant structures than the morphologically very similar forms passed in the fæces of fleas infected with their natural flagellates.

In this connection some very interesting experiments have been recorded recently by Laveran and Franchini. These investigators, working in Paris, have found that here, as elsewhere, the fleas from dogs may harbour this flagellate, and they have attempted to infect mice by injecting them intraperitoneally with the contents of the guts of infected fleas, with the result that they have found that the leishmania forms of the flagellate could be recovered from the peritoneal exudate blood and organs of the inoculated animals some weeks after injection. This proves that the leishmania forms of the flea flagellate will at any rate survive a considerable time in the body of the mouse. If now a mouse is injected intraperitoneally with leishmania from a case of kala-azar, in most instances the parasites can be recovered from the peritoneal exudate and tissues of the mouse for a considerable time after inoculation, but usually they disappear after a varying interval without producing any recognizable disease. In fact, the injection of leishmania from a case of kala-azar into the mouse produces a condition somewhat comparable to that arising from an injection of the leishmania forms of the flea flagellate. This of course does not prove that the flea flagellates and the leishmania are one and the same thing, but it has suggested to the author that in dealing with the parasites of the leishmania group one may have to do with an insect parasite which is just adapting itself to a vertebrate host. It is most probably correct that all the blood-inhabiting flagellates of the trypanosome group were originally parasites in the insect gut alone. Before they were adapted to a vertebrate host, the individual insects became infected from one another by the small encysted leishmania forms which were found in the fæces. This happens with the flea flagellate, for the leishmania forms are found in the fæces and are eaten by the larval flea. Now when a trypanosome, for instance, has become perfectly adapted to a vertebrate host, there is no longer

any necessity for the arthropods to infect themselves from one another by means of leishmania forms passed in their fæces, though as far as one knows some of them may still do so, because they can more certainly take up the parasites which now maintain themselves on the blood of the vertebrate. But it is quite conceivable that a flagellate of an insect like the flea, which naturally passes from insect to insect directly, may become adapted to a vertebrate host, so that the insect in question may be able to infect itself by feeding on the blood of an infected vertebrate, or by eating the fæces passed by an already infected insect. It is possible that the leishmania diseases are of this type, and that one has to do with a flagellate of an insect which naturally passes from insect to insect directly, but occasionally obtains a footing in the human body, producing the disease of kala-azar and Oriental sore. The experiments of Laveran and Franchini could be explained in this way.

The author drew attention to the fact that many observers, especially Basile, seemed to think that every case of infantile kala-azar must necessarily be associated with some infected dog.

It is quite true that human and canine cases exist side by side in a manner which cannot better be illustrated than by the instance quoted by Sergent Lombard and Quilichini, where, in an isolated farm outside Algiers, they found a child, a dog and a kitten all suffering from the disease. The most reasonable assumption is that these three unfortunate victims either infected one another or all became infected at the same time. But it has been repeatedly shown that cases of infantile kala-azar occur quite apart from dogs.

In Malta the author came across an interesting case in which twins about two years of age both suffered from kala-azar. As one commenced to be ill some time after the other it is probable that the first child infected the second. The home, a laundry, in which the family lived, was some distance outside Valetta, and here two dogs were kept. A careful inquiry showed that the dogs had never had any illness and at the time they appeared perfectly healthy. Liver puncture was performed on the dogs with negative result. The author expressed it as his opinion that the canine and human diseases were the same, but that he did not think there was any evidence to warrant the conclusion that a human being must necessarily be infected from a dog. An infected child is dangerous, not only to any other children with whom it may come in contact, but also to dogs in just the same way as an infected dog is dangerous to other dogs and children.

Knowing that the human flea, *Pulex irritans*, is the one which most commonly attacks man, while the dog flea *Ctenocephalus canis*, attacks dogs, in order to explain his hypothesis Basile realized that if the disease is to pass from dogs to children it would do so more rapidly if the human flea fed upon infected dogs. He states that in Sicily, where most of his investigations were undertaken, the human flea is quite a common ecto-parasite of dogs. In Malta this was certainly not the case, for of over a thousand fleas off dogs examined by the author not a single one was *Pulex irritans*. The human flea is, however, very common in Malta, so that there was every opportunity for them to get on to the dogs.

On the subject of canine kala-azar the author stated that he had examined 46 stray dogs for evidence of natural leishmania infection. In order to test the accuracy of liver puncture as a means of diagnosis this operation was performed before the animals were killed, after which the spleen and bone marrow was examined. Unfortunately, liver puncture proved quite unreliable as a means of diagnosis, for in no case were leishmania found in the liver smears before examination of the spleen after the animals were killed. Of the 46 dogs examined six were found infected by examination of the spleens *post mortem*. The examinations were made in the months of June, July and August, 1913, and it is interesting to note that the percentage of infections was approximately the same as that found by Dr. Critien in Malta during April and May, 1910. An important point to note is that the great majority of dogs examined were in perfect health, and it was only amongst the few that were evidently ill and in bad condition that the cases of infection were found. Canine piroplasmosis does not exist or is very rare in Malta, so that the commonest disease of dogs in this island appears to be kala-azar. It would, therefore, be fairly easy to insist that all unhealthy dogs should be removed from the neighbourhood of human beings, or, preferably, killed. It is just as important also to prevent children, who show symptoms pointing to kala-azar, from coming into contact with other children or dogs.

In connection with the diagnosis of kala-azar and also Oriental sore, it is well known that it may be impossible to find the parasites by microscopic examination. In such cases the culture method may be of some assistance. It has happened several times in connection with examination of experimental animals, that the inoculation of tubes of N.N.N. medium from the organs has given rise to a culture of flagellates, while microscopic examination of smears from the same organs has been negative.

The author was asked by Prof. W. J. Simpson to see a case of ulceration on the margin of the ear. The disease had apparently been contracted in S. America. Smears from the base of the ulcer, as well as from the swollen red margin, failed to reveal any leishmania, though the condition was suspected as dermal leishmaniasis. By puncture of the red margin of the ulcer after sterilization of the skin with alcoholic iodine solution, material was obtained for the inoculation of these tubes of N.N.N. medium.

After three weeks flagellates began to appear in one of the inoculated tubes, thus proving that leishmania had been present in the lesion, though in numbers too small to be detected by ordinary microscopic examination. This is the first instance in which the culture method has been used as a means of diagnosis in this disease.

As regards the relation of kala-azar to Oriental sore, some recent experiments are of great interest. Gonder has shown that mice may be infected with

leishmania from kala-azar and Oriental sore, and that in each case a general infection is produced, with enlargement of the liver and spleen, in which the parasites may be very numerous. One difference, however, becomes evident, in that the mice infected with the Oriental sore virus eventually develop peripheral lesions on the feet, tail and head, and in these lesions leishmania are readily found. In the case of mice infected with the kala-azar virus no such peripheral lesions appear, so that Gonder is led to suggest that Oriental sore, like kala-azar, is really a general infection, the earlier stages of which have been overlooked, and that it is only in the later stages that peripheral lesions develop on the skin.

The exact method of infection with Oriental sore is not known, but the author stated he had inoculated the virus directly in four human beings and in every case after an incubation of some months a typical sore appeared at the point of inoculation, or close to it.

If the infection during the period of incubation, which is a long one, had been of a general nature one would at least expect some sores to appear elsewhere than at the site of inoculation.

The author had the same experience in the inoculation of monkeys, cats and dogs with the virus of both Eastern and South American sores. The author attempted to test the relationship of Oriental sore to kala-azar by inoculating a dog which had recovered from Oriental sore with a large dose of virus from the spleen of a case of kala-azar. The dog did not appear to have contracted the disease, so was killed between three and four months after injection. No leishmania could be found in the organs.

As regards the cutaneous leishmaniasis of S. America it was pointed out that the condition leading on to extensive involvement of the nasal and buccal cavities might be very different from the Oriental sore of the East, though recently Castellani had described some cases of oro-pharyngeal ulceration from Colombo in which leishmania had been discovered.

Working with virus from South American sores the author had not been able to find any features, either morphological or cultural, to distinguish it, nor were any differences noted in the infection of animals. It still remains a fact that clinically in man the South American disease may be very different from that of the East, so that the question of the identity of the parasites must be left for future research.

In summing up the author suggested that kala-azar, whether in children or adults, in all parts of the world is caused by the parasite, *Leishmania donovani*, while Oriental sore is caused by *Leishmania tropica* in the Old World and probably also in South America, though this cannot be regarded as finally settled.

Experiments with Malarial Parasites and Piroplasma canis.—In a paper, entitled "Weiteres über die Züchtung der Malariaparasiten und der piroplasmen (*Piroplasma canis*) in vitro" (*Archiv für Schiffs- und Tropen-Hygiene*, February, 1914), Professor H. Ziemann describes further experiments with the culture of malarial parasites. In this case the parasites were obtained from a patient who was infected with the double benign tertian variety, and who recovered naturally from the attack without special treatment. The development of the parasites in the culture tube was controlled by examinations of the parasites as they developed in the blood.

It was found that—

(1) Without dextrose the parasites would not develop in citrated blood, but quickly degenerated.

(2) In the dextrose culture the female gametocytes were the most persistent forms, and lasted longest in the culture, as in the patient's blood. Active nuclear change took place in the gametocytes during the early stages of culture.

(3) Just as in the blood of the culture, the parasites showed no active multiplication, though there was a tendency for a longer persistence in culture than in the blood.

(4) In the culture, together with many degenerating forms which are often seen in the blood of cases with a tendency to spontaneous recovery, there are other parasites which appear quite normal.

(5) Just as in the blood of such cases, the parasites tend to disappear spontaneously, so in the cultures from these cases subculture is not possible.

Unless the progress of events in the cultures had been controlled by parallel examinations of the blood, it might have been thought that the tendency of the parasites to die off in the tubes was an abnormal event, whereas the same tendency was shown in this case by the same parasites in the blood of the patient who recovered spontaneously.

In reference to *Piroplasma canis* culture, multiplication takes place much more readily than in the case of human malaria, for corpuscles are seen containing as many as sixteen to thirty-two merozoites. Attempts have been made to inject fifty-two dogs with cultures of *P. canis*. Only twice has it been found possible to inject the animals with old cultures, even with intravenous injection—once with a sixteen-day culture and once with a twenty-day culture. These cultures had apparently been maintained at room temperature (18° C. to 22° C.).

Leprosy after Two-year Incubation Period.—The father of the patient, V. T., now aged 31, Filipino, native of Laguna Province, was admitted to the Culion Leper Colony, August 10, 1908, with the clinical diagnosis of tubercular leprosy, microscopically positive. The mother of the patient, G. T., Filipina, now aged 37, native of Bataan Province, was admitted to the Culion Leper Colony, February 10, 1910, with the clinical diagnosis of mixed tubercular and anæsthetic leprosy, microscopically positive. The patient, a girl born at Culion, May 15, 1911, an inmate of that institution to date, when examined, June 30, 1913, presented no clinical evidences except slight reddening of the cheeks over the malar bones and reddening of the lobes of the ears. Those especially versed in the diagnosis of leprosy would probably regard this reddening as due to leprous dermatitis. Microscopic specimens prepared from scrapings from the cheek and the septum of the nose were positive for leprosy.—Victor G. Heiser, M.D., Director of Health, Philippine Islands, Manila.

Abstracts.

THE THIRD ALL-INDIA SANITARY CONFERENCE, LUCKNOW, JANUARY, 1914.

President.—The Honourable Sir Harcourt Butler, K.C.S.I., C.I.E., I.C.S., Member of the Governor-General's Council, in charge of the Department of Education.

President's Address.

Gentlemen,— The year's retrospect shows steady advance in many directions. We may not—we must not—be satisfied with the present rate of progress, but there are no short cuts to the ends which we have in view. We have arrayed against us the habits and prejudices of centuries. We cannot in the land of the ox-cart get the pace of the motor-car. If ardent spirits are fretful at the rate of progress, they should at least realize that there has recently been greatly accelerated achievement and that there is a sanitary awakening which none can justly gainsay. In both hygiene and research the results give ground for hope.

In regard to the sanitary services, four appointments of Deputy Sanitary Commissioner have been added to the eight new appointments sanctioned in 1912. The twelve new appointments have been allotted as follows: Three to Bengal; two each to Madras, the United Provinces, and Bihar and Orissa; and one each to the Punjab, the North-west Frontier Province and Burma.

Of these appointments, three are reserved for the present for officers of the Indian Medical Service, and the remaining nine are open to medical men recruited in India, of whom eight—all Indians—have already been appointed. In addition, 39 first-class and 104 second-class health officers are to be appointed to the municipalities. In order to assist local governments in organizing the service without delay a recurring grant of 2·66 lakhs of rupees has been sanctioned from Imperial revenues in addition to a grant of Rs. 25,560 per annum to the North-West Frontier Province. The Government of India are meeting the cost of the new appointments of Deputy Sanitary Commissioner on the scale sanctioned for Indians, and are giving a subvention amounting to half the pay of first- and second-class health officers. Special attention is also being paid to the training of sanitary inspectors. The necessity of enlarging the bacteriological department has also been recognized, and the Secretary of State has already been addressed on the subject. I hope also that the Secretary of State will soon be addressed regarding an increase in the sanitary engineering staff.

As to the disposal of the grants for sanitary and anti-malarial schemes, the non-recurring grants for the purpose of urban sanitation in 1913-14 amounted to 150 lakhs, or £1,000,000 sterling, exclusive of a sum of 13¾ lakhs for special schemes in the North-west Frontier Province, Delhi, Bangalore, Indore, Quetta and Mercara. The recurring grants for sanitation in the same year amounted to 45 lakhs, or £300,000 sterling per annum, of which 5 lakhs was reserved for research and anti-malarial projects. The remaining 40 lakhs recurring and the non-recurring sum of 150 lakhs have been distributed amongst the different provinces in lump sums. Schemes for the improvement of rural sanitation are not yet sufficiently advanced to justify Imperial grants, but they are receiving attention. In the provinces which benefited by the transfer to district boards of the entire net proceeds of the land cess to the amount of some 82 lakhs, or over £546,000 sterling a year, there should be no difficulty in financing sound schemes of rural sanitation. It is hoped that considerable sums will be set aside for the improvement of rural water supplies, for anti-malarial measures, for the protection of grain stores, and for general sanitation.

Since the new department was formed in January, 1911, Imperial grants made for sanitation, research, and anti-malarial measures have amounted approximately to Rs. 4,55,74,000, or £3,038,266 sterling, of which Rs. 49,50,000, or £330,000, are recurring and Rs. 4,06,24,000, or £2,708,266, are non-recurring.

During the year the following grants have been made by the Research Fund for anti-malarial measures:—

	Rs.
(1) Part contribution to anti-malarial measures at Palwal in the Punjab	14,000
(2) To complete schemes at Saharanpore, Nagina and Kosi	2,00,000
(3) For similar purposes in Ennore ...	58,700
Total ...	2,72,700

No grant has yet been made for the Meerut and Kairana schemes, which are still under consideration. Other grants made from the Research Fund have been:—

	Rs.
(*a*) For equipping research laboratories of the Calcutta School of Tropical Medicine, the foundation stone of which will shortly be laid by His Excellency Lord Carmichael ...	1,00,000
(*b*) For improving the laboratories and teaching accommodation at the Central Research Institute, Kasauli	16,000
(*c*) For an elaborate experiment in water filtration at Benares	1,50,000

(*d*) A grant of Rs. 2,000 to Captains Patton and Cragg to assist them in producing a treatise on medical entomology, which is now in the press.

(*e*) A contribution of £500 per annum for a period of three years to the Imperial Bureau of Entomology for the investigation of noxious insects.

(*f*) Grants of Rs. 1,000 each to the Bombay Bacteriological Laboratory for a practical experiment in the disinfection of grain in bulk, and to Professor McMahon, of the Canning College, Lucknow, towards an investigation into the chemical composition of milk in the United Provinces.

Since the inception of the Research Fund we have received in grants Rs. 16,00,000 and disbursed Rs. 14,35,000, in accordance with the advice of our Scientific Advisory Board.

The actual work carried out during the year under the auspices of the Indian Research Fund Association and of the various provincial administrations has been considerable. There are at present nine medical officers working on special malarial inquiries in seven provinces. You will also be glad to hear that the Secretary of State has sanctioned the establishment of a Pasteur Institute at Rangoon, the director of which will combine bacteriological and serological research with his routine work.

As regards the immediate future it is proposed to institute at Poona an investigation with reference to the fixation of bacteriological standards of purity for drinking water. Inquiries will also be made into the etiology of diabetes, leprosy, and the fevers of uncertain origin. Although diabetes is not, strictly speaking, a "tropical" disease, it leads to the death of so many valuable lives in India that an inquiry into its causation and prevention has become necessary. This inquiry will, however, be one of considerable difficulty, as the disease does not attack the class of people who come to hospital for treatment, being confined almost exclusively to the richer and more intellectual classes, especially those who lead sedentary lives. In addition we intend to carry out at Benares an elaborate practical experiment in water filtration, with the object of ascertaining the best methods of silt removal and determining the relative merits under varying conditions of the different types of mechanical filters and of sedimentation both with and without the addition of chemicals.

I recommend to your careful perusal the able reports by Major James on the protection of India from yellow fever and on the practicability of stegomyia reduction in Indian seaports which were published in the second number of the *Journal of Medical Research*. It is gratifying to learn that in Major James's opinion there is no immediate danger of importation of infected mosquitoes in India after the opening of the Panama Canal. At the same time Major James urges that this does not justify inaction, and points out that a continuous water supply is an essential preliminary to any attempt to reduce the numbers of stegomyia mosquitoes in our seaports. During the last year Major James has been on deputation with the Ceylon Government and has carried out an extensive anti-stegomyia campaign in Colombo. I deeply regret that he has now been stricken by serious illness and must proceed to England as soon as he is fit to travel. I am sure that you will all join with me in wishing him a speedy recovery and a quick return to the scene of his useful labours.

The new Indian *Journal of Medical Research* has now appeared and its third number is in the hands of the delegates. It has met with a most cordial reception not only in India, Great Britain and the Colonies, but also on the continents of Europe and America, and its circulation is already very large and is steadily increasing. If you will consider the style of its production, you will understand that at the low subscription rates now charged it will not be a financial success unless our subscription list is considerably increased. It is at present financed by the Indian Research Fund Association, but we have no right to count on such support for an indefinite period. I trust, therefore, you will all do your best in increase its circulation. Here I may mention that all the papers presented to the Conference have been printed in such form as will enable them to be issued as supplements to the *Journal*. In this way they will secure a far wider circulation than is possible when they are published merely as appendices of an official report. They will, moreover, be issued immediately after the conclusion of the Conference and will thus be in the hands of the public many months sooner than was possible under our previous arrangements.

I attach great importance to the work of the provincial pilgrim committees with whom the Sanitary Commissioner with the Government of India is zealously co-operating. The great pilgrim centres are foci of epidemic disease and sanitary improvements in them will add much to the health and the comfort of the general population. In this connection I may note the important bearing of Major Greig's researches into cholera. During the winter of 1912-13 the Pilgrim Committee toured extensively in the United Provinces. Their report is now under consideration. One of the most important recommendations of the Committee was the improvement of the great Badrinath Pilgrim Route, regarding which a most interesting report has been written by Mr. G. Adams, of the Indian Civil Service—it will be found in the January number of the *Journal of Indian Research*. The Government of India have made a grant to the Local Government of 6 lakhs non-recurring to be spread over five years, and Rs. 20,000 recurring for this object, and it is hoped that the Local Government will be able to meet the balance required to complete the scheme from provincial revenues. These improvements should be greatly appreciated by many thousands of pilgrims journeying from all parts of India.

I now turn to the proceedings of the Conference. The only change in procedure this year is that for administrative convenience; malaria is now dealt with in the research section instead of our holding a separate malarial conference.

An analysis of the agenda paper is interesting. There are no less than twelve contributions on problems in connection with malaria. No subject has attracted so much attention. Urban and rural water supplies are treated of in seven valuable contributions and milk supply in six. Four papers deal directly or indirectly with town planning, and four also with the important subject of vital statistics. The range covered by these papers is very wide, and time will not permit of my dealing with them in detail; but I must allude briefly to a few of them, and I would first direct your attention to the

three important papers on "Bonificasione," which are on the agenda for discussion this morning. This method is said to have given good results in Italy, and the papers, which, as you know, were presented to Government some years ago, are reproduced here in order that the question as to how far the method is applicable to India may be thoroughly ventilated and discussed.

Another important subject for discussion is the question of the milk supply. It is obvious that we must fix standards of purity with reference to the Food and Drugs Act, but the question is complicated by the fact that milk in India is often a mixture of cow's and buffalo's milk. There are, moreover, administrative difficulties in connection with religious and caste prejudices and with the possibility of raising the price beyond the means of the poorer classes.

As regards town improvement, you will have opportunities of seeing examples of this in Lucknow before the discussion on this subject takes place. You have also before you a technical and elaborate paper by Mr. Orr, which throws much light on the difficult subject of the regulation of light and air—points which are of vital importance in view of the steady increase of tuberculosis amongst the urban population.

Then you have three very important papers on the subject of plague. Those of Captain Kunhardt suggest a possible new departure in our plague policy. In one of our resolutions last year we directed attention to the necessity for carrying on active anti-plague measures in certain selected villages during the quiescent period. Captain Kunhardt's present report shows us how to select the villages which require special attention. His suggestions are now under consideration, and it is possible that we may decide to carry out an experiment of this nature on a large scale under the auspices of the Research Fund. The paper from Parel on grain disinfection reports the results of the experiments for which we gave a grant of 1,000 rupees. These experiments are of considerable value in view of the rapidly accumulating evidence as to the part played by grain in the introduction and spread of plague not only in India, but also in Java, Manila and the Straits Settlements.

Another paper, to which I would draw special attention, is that of Major Cook Young on the "Incineration of Rubbish and Night Soil in Delhi City." Those of us who live in the vicinity know what a wonderful effect this has had in mitigating the fly nuisance. Our experience in this matter illustrates in a practical manner how large a portion of the discomforts which we suffer and the dangers to which we are exposed in India are due to defective scavenging.

Lastly, I wish to refer to the lantern exhibition of type-designs from all the different provinces, which, it is hoped, will afford a valuable opportunity for exchanging views and discussing local peculiarities and difficulties.

Research in all its many branches is lifting the veil that hides the secrets of disease and mortality, but we shall not fully benefit by its discoveries until the people are educated to receive them. In a resolution, dated February 21, 1913, the Government of India commended to local governments a thorough inquiry into the teaching of hygiene in schools and colleges and attention to the personal hygiene of the students—a subject upon which Rao Sahib Ganesh Nagesh Sahasrabudhe and Rao Bahadur Gopal Das Bhandari have written instructive papers. We are also most anxious to enlist private co-operation, and have reason to hope that the Indian Council of the St. John Ambulance Association will come to our assistance. Practical details of any scheme eventually adopted will be worked out when the reports of the provincial committees of inquiry have come in. At present the general idea is to impart instruction in first aid and domestic hygiene in certain schools and to encourage active workers of the Association to afford assistance in the inspection of pupils and the school premises. It has also been suggested that special training in hygiene should form part of the curriculum for teachers. Any such scheme, however, will leave the adult population untouched. In order to reach them it is proposed to organize, under the auspices of the Indian Research Fund Association, a Central Bureau, where a sufficient number of good lantern slides, models, pictures and skeleton lectures could be stocked. These would be issued to the several provincial sanitary commissioners to be distributed by them on loan to health officers and medical men for the purpose of popular lectures to the staff at the differnt fairs and to the staff of travelling dispensaries. With the sanction of the Government of India, the United Provinces Government has recently created and financed 26 additional travelling dispensaries in the United Provinces and the employment of three officers of the Indian Medical Service to supervise them at an estimated cost of 89,000 rupees per annum. Small exhibitions might also be organized and bacteriological leaflets be distributed at religious melas. Nor can we stop here if we wish to achieve complete success. Colonel Firth speaking before the United Services Institution at Simla, and, simultaneously, Sir Pardey Lukis delivering the inaugural address at the London School of Medicine for Women—the one from the military, and the other from the civil standpoint—expressed their strong conviction that we shall never make any real advance in domestic or personal hygiene until we have convinced the women of the country as to its necessity. This object we can achieve in two ways. The one is by encouraging medical women to preach the gospel of health inside the zenana and to organize purdah parties at which they will give lantern demonstrations, for which purpose we shall be glad to lend them the necessary apparatus. The other method is by a cautious development of the system of employing nurse district visitors and sanitary inspectresses. You have before you an excellent paper on this subject from Madras, where the experiment has been in progress for the last six

months, and I understand that similar useful work has been inaugurated in Bombay by Dr. Turner, who, I am glad to learn, is giving us the benefit of his great experience in a work on sanitation in India which is shortly to be published. I trust that the two papers which I have mentioned will lead to a full discussion of the whole subject, for I am convinced that if we can succeed in working out a practical scheme it will have a lasting effect upon the welfare of future generations, both by increasing their knowledge of preventive measures and by improving their general standard of health and physique.

You will thus recognize that essential and far-reaching systems of sanitary education are now in the air. I hope that we shall soon be able to publish a resolution on general sanitary policy and address local governments with a view to the working out of definite schemes. We have before our eyes the remarkable achievements on the military side by the service so ably directed by Sir Arthur Sloggett. The military conditions are not comparable to those with which we have to deal. We have to handle, not small numbers of adults under military discipline in sanitary surroundings, but many millions of men, women and children living in most unsanitary surroundings under little or no control. We have to carry the people with us, and there are limits to the powers of education which no amount of money can altogether remove. But we can do much, and I know this—that you will press forward patiently, but persistently, with long vision and high sustaining hopes, and, believe me, gentlemen, you will succeed.

Introductory Address.

By the Honourable Surgeon-General Sir Pardey Lukis, K.H.S., K.C.S.I., M.D., F.R.C.S.

Director-General, Indian Medical Service.

The first paper on the subject of malaria to which I wish to allude is the contribution relating to the incidence of enlarged spleen among school children in London, for which we have to thank Sir Ronald Ross and Majors Christophers and Perry. Its chief interest and importance are in view of the fact that an estimation of the spleen-index of children is the most readily applicable measure we possess for measuring the intensity of malaria in a given locality. We can now continue to use this method of measuring malaria with increased confidence in its value and fewer doubts as to its validity, except perhaps in districts where kala-azar is prevalent.

With regard to jungle clearing, last year the Indian Research Fund proposed to allot to Bengal a considerable sum of money for the purpose of carrying out an extensive experiment of jungle clearing in the vicinity of inhabited areas. There has been considerable delay in starting this experiment, owing to the fact that the Provincial Malarial Committee of Bengal do not consider that the evidence put forward by us of the connection between jungle and malaria has borne the test of further investigation. They are of opinion that extensive jungle clearing in Bengal villages is impracticable. It appears to me that this decision is due to a misapprehension of the intentions of the Scientific Advisory Board. The Provincial Committee, acting upon the reports of Major Fry and Dr. Bentley, take the term "jungle" to mean all vegetation, including fruit trees and bamboos. We never intended any such wholesale destruction of valuable property; all we aimed at was the eradication of rank undergrowth and scrub and useless trees. The condition of affairs round a Bengal village was ably described by Buchanan one hundred years ago as quoted by Bentley himself in the November number of the *Indian Medical Record*. He says "the great variety of lofty flower and fruit-bearing trees and the luxuriant bamboos by which the cottages are shaded would render their situation delightful, did not rank weeds and bushes, which shoot up with increasing vigour in every corner that is not in constant cultivation, prevent all circulation of air, preserve a constant damp, noisome vapour and harbour a great variety of loathsome and pernicious animals." This is the condition we want to remedy. Dr. Bentley, in the last paragraph of his able paper "On the Reaction of Mosquitoes to Artificial Light," alludes to the generally accepted theory that a screen of trees is beneficial as a protection against malaria and mosquitoes. The question here, however, is not one of a screen of trees; it concerns the eradication of scrub or undergrowth. We have moreover in Major Marjoribanks' suggestive paper on "Malaria in the Island of Salsette," striking evidence of the deleterious effect of jungle around the village site. He shows that it is possible to map out a series of "*isoplens*"; that the most malarious villages are those at the foot of the hills, where the jungle is densest, and that the malarial endemicity steadily decreases as you go farther and farther from the jungle belt. To explain this he advances the very plausible theory that the scrub and jungle afford shelter and humidity to the female mosquito, thus enabling her to live on into the dry season and increasing the period of her infectivity towards man. Major O'Gorman Lalor, too, in his recently published report on "Malaria in the Katha District" advocates as a measure of practical utility the cutting down and burning of all scrub jungle twice yearly in, and for a radius of one mile around, every malaria-stricken centre of population.

Another matter upon which we require further information, and which formed the subject of one of our resolutions last year, is as regards the precise conditions under which wet cultivation is, or is not, likely to be harmful from the point of view of malaria. So far, with the exception of a brief allusion in Major Marjoribanks' paper, no reports on this subject have reached us, though we trust that Captain Hodgson, who is now on special malarial duty in Madras, may have something to tell us next year.

I will now pass on to a report on certain important observations which has been published by Wade-Brown in the *Journal of Experimental Medicine* for July last. In this article the author, after referring

to his previous experimental work on hæmatin-intoxication in the rabbit, produces evidence to prove that the anæmia, the hæmoglobinæmia, the high percentage of large mononuclear leucocytes, the destruction of platelets and the tendency to hæmorrhage in malaria are all influenced by the malarial pigment "hæmatin." He gives it as his opinion that hæmatin is probably the hitherto unknown circulating toxin to which malarial anæmia has been attributed and he points out that the hæmoglobin, converted to hæmatin by the malarial parasite, is not readily available for the regeneration of the red cells and the blood is thus rapidly depleted of hæmoglobin and iron. In a later report Wade-Brown deals with the renal complications in hæmatin intoxication, but his investigations throw no light on the problem of hæmoglobinuria.

On the subject of blackwater fever the most recent work appears to endorse the opinion that without malaria there is no blackwater fever; but it is still by no means certain that they stand towards one another in the relation of cause and effect. Notwithstanding the fact that Balfour and most other observers are disposed to doubt the parasitic nature of Leishman's cell inclusions and the suggestion that they might be of the nature of chlamydozoa, or that they play any part in the causation of blackwater fever, Leishman still inclines to his original view. In a recent article on the etiology of blackwater fever he discusses the usually accepted hypothesis as to its causation and admits that there is at present no actual proof of the existence of a specific virus. He argues, however, that the chlamydozoal hypothesis is not inconsistent with well-established points. Thus the association of blackwater fever with malaria is comprehensible if it is assumed that the chlamydozoal virus is transmitted either by mosquitoes or by some different insect whose geographical distribution is similar, and he points out that mosquitoes transmit at least four diseases, two of which (yellow fever and dengue) are due to filter-passing viruses. He urges, moreover, that neither the immunity of natives in endemic areas nor the fact that immunity to malaria appears to go hand in hand with that of blackwater fever can be regarded as being inconsistent with the new hypothesis; whereas, on the other hand, the well-known discrepancies in the geographical distribution of the two diseases may be explained by assuming that some insect, resembling the mosquito in its life habits, transmits the specific virus, and that, in those intensely malarious regions in which blackwater fever does not occur, this insect may be either less numerous or not so widely distributed. In conclusion he suggests another possible connection between malaria and blackwater fever, namely, the possibility of the malarial parasite being itself subject to disease. Another theory worth remembering is a suggestion put forward by Balfour that blackwater fever may be caused by the injection of a highly virulent hæmolysin by some insect.

Turning to the subject of the *Spirochætoses*, Major Bisset confirms Mackie's original discovery that *Pediculus vestimentorum* is the carrier of the disease, and also Nicolle's observation that relapsing fever is transmitted by the accidental crushing of the lice during scratching, the mere bite being innocuous. He is, however, inclined to the belief that infection is transmitted, not so much as the result of actual scratching, but that it is due to the prevalent habit of killing a louse by crushing it between the finger-nails. As regards preventive measures, he points out that there must be an active crusade against lice and that the present method of killing them must be discouraged. The importance of the crusade against lice is emphasized by Major McKechnie's report on his investigation into a mysterious fever occurring at Bhim Tál. This fever he believes to be true typhus, the carrier of which Nicolle suspects to be *P. vestimentorum*, though Patton, Husband and McWalters incriminate *Cimex lectularius*, at any rate so far as Indian jails are concerned. Captain Brown, who has also investigated relapsing fever in the Meerut district, confirms Bisset's findings both as regards lice and the ease with which they may be killed by the exposure of clothes and bedding to direct sunlight. He suggests, however, that the possibility of conveyance of infection by *Bragada picta*, one of the harvest bugs, is deserving of investigation. It is obvious that we must not regard *P. vestimentorum* as the only carrier of spirillar fevers in India. Jukes has reported cases of spirillar fever occurring in the Darjeeling district, in which the temperature is irregular and shows no resemblance to that of relapsing fever. In all these cases jaundice was a marked symptom and there was a high rate of mortality. Jukes is inclined to regard the fever as hitherto undescribed, but in my opinion it is identical with the biliary remittent fever of Vandyke Carter. This, however, is merely an academic question: the important point is that lice and bugs from the infected houses were dissected and in no instance were spirochætes found in these insects.

In this connection I must mention that during the past three or four years a peculiar fever, accompanied by jaundice, has been noticed in the Andaman Islands. The jaundice, which appears on the third or fourth day, is often intense and in severe cases there are petechial hæmorrhages, bleeding from the gums and delirium. The mortality is 40 per cent. Hitherto this fever has been regarded as malarial, but no malarial parasites are found in the blood and treatment by quinine is of no avail. Major Woolley thinks this fever may be classed as a separate entity. I suggest that it may possibly be spirillar.

Patton has examined both the spleen and bone marrow of 1,321 dogs destroyed in the lethal chamber at Madras and in no case was a dog found to be naturally infected with Leishmania. It is evident therefore that, in the endemic centres of kala-azar in India, dogs are not infected as they are on the Mediterranean littoral. We have, moreover, the evidence of Mackie that the main point of epidemiological interest in the disease is its dependence upon *close personal contact*.

Beriberi is not included in our agenda, but Dr. de Mello, in his paper upon "The Notification of Disease," expresses the opinion that beriberi cannot be attributed to rice. On the contrary, he believes it to be infectious and contagious. That he is not alone in this opinion is evidenced by the fact that during the last year communications have poured into the medical press, notably from the Amazons, Brazil, Southern Nigeria and Shanghai, in all of which the authors express grave doubts as to the accuracy of the "*deficiency*" theory, and I am informed by Colonel Blenkinsop, R.A.M.C., that, when he was in Sierra Leone, he had under his care several British officers suffering from clinical beriberi. A few months ago, moreover, there was an outbreak of peripheral neuritis closely resembling beriberi amongst the British troops at Lebong. None of those attacked were rice-eaters and the majority of them were total abstainers.

INTESTINAL SCHISTOSOMIASIS IN THE SUDAN.*

By Captain R. G. Archibald, M.B., R.A.M.C.

Schistosomiasis exists as a common parasitic infection among the inhabitants of Egypt, and it is mainly due to the excellent researches that have been carried out by different observers in that country that our knowledge of the disease has been obtained. There are, however, particular aspects of it as met with in the Sudan that merit a certain amount of attention, inasmuch as the disease is responsible for a clinical picture that often presents some difficulties to the diagnostician.

The cases, described in this paper representing the intestinal type of schistosomiasis, are examples of some of the so-called pyrexias of uncertain origin met with in the Sudan. The patients affected have usually been well-nourished adults admitted to hospital with fever, headache, furred tongue, and frequently enlarged spleen. As will be seen from the clinical histories of a few of the cases, neither diarrhœa nor tenesmus form constant symptoms; indeed, they are frequently absent.

Case 1.—An Egyptian soldier, admitted to hospital in a weak condition with fever and an enlarged liver and spleen. Diarrhœa was not present. Six months previously, while in an out-station, the patient had suffered from an attack of diarrhœa, with blood and mucus in his stools, but since then had been free from similar symptoms. The peripheral blood was examined, and, apart from a leucocytosis, nothing abnormal was noted. The spleen was enlarged to a point about 3 in. below the ribs, and on palpation was of a doughy consistence. The liver increased in size, and in view of the leucocytosis present an exploratory operation was carried out, but no sign of an abscess could be found. Quinine injections failed to influence the temperature. No examination of the fæces was carried out owing to the absence of intestinal symptoms. The patient became weaker, and died on the seventh day after admission.

Post-mortem examination showed that there was extensive ulceration of the large intestine. Smear preparations from the base of the ulcers revealed the lateral-spined ova of *Schistosomum mansonii*. Adult worms were present in the iliac and portal veins. The liver was fatty and cirrhotic and the spleen congested and enlarged.

Case 2.—A powerful-looking Egyptian soldier was admitted to hospital suffering from pyrexia. His blood was examined for malarial parasites, but with negative results. The temperature fell to normal on the third day after admission, and he was discharged from hospital at the end of a week. Five days later he was readmitted with high fever, and looked very ill. He complained of headache and rigors. The tongue was thickly furred and the spleen slightly enlarged. The abdomen was distended but not rigid. No diarrœhic symptoms were present. Blood examination proved negative for malarial or other parasites. The patient became steadily worse, his condition closely simulating a case of enteric fever; the fæces were rather fluid in character and of a pea-soup colour. Two days later he was passing almost pure blood per rectum. A rapid enlargement of the liver was observed, but no jaundice was noted. Examination of the fæces was carried out. Neither the ova of intestinal parasites nor amœbæ were found. A daily increased enlargement of the spleen was then observed, and the organ eventually reached a point level with the umbilicus. The patient appeared to be in a state of acute toxæmia, and died on the seventh day after admission to hospital.

Post-mortem examination showed very extensive ulceration throughout the large intestine as high up as the ileo-cæcal valve. In this area there was a small intussusception, with ulcers present in that portion of the gut forming the intussusceptum. Smear preparations taken from the base of the ulcers showed the existence of lateral-spined ova of *Schistosomum mansonii*.

Case 3.—An Egyptian soldier was admitted to hospital suffering from fever and diarrhœa. He was somewhat anæmic, and the spleen was slightly enlarged. Blood examination for malarial parasites proved negative. After admission the patient's condition quickly became worse. He lost flesh rapidly, and his whole appearance was one of extreme lassitude, suggesting a toxæmic condition likely to be attended with fatal results. The diarrhœa was a feature of the case from the onset. The fæces were examined, and the lateral-spined ova of *Schistosomum mansonij* were found.

The observations made *post mortem* on the previous cases suggested the possibility of good results accruing if vaccine therapy was employed. A sample of the patient's stools was obtained and plated out on suitable media. The plates were carefully examined, and contained for the most part two different types of *B. coli* colonies. Their cultural characters were worked out, and a bivalvent auto-

* Abstract of paper in *British Medical Journal*, February 7, 1914.

genous vaccine prepared. The patient received a first dose of 0·5 c.c., representing 250 million organisms, followed five days later by a dose representing 500 million. The result obtained was striking. After the first injection the patient stated he felt much better. A marked and rapid improvement in his condition set in. The diarrhœa ceased, the temperature fell, and a week after the second dose he was discharged fit from the hospital.

Case 4.—The patient was a woman of about 24 years of age, who had never been out of Khartoum. She was admitted to hospital with fever, anæmia, and debility, and a very enlarged spleen extending to the umbilicus. Examination of the peripheral blood was negative for malarial parasites, and a careful search for evidence of malarial pigment was attended with negative results. The red blood corpuscles showed a certain degree of poikilocytosis and microcytes, and a few normoblasts were present. In addition, there were found oval and circular cells about 3·5 μ in diameter, whose cytoplasm stained a delicate blue with Leishman stain. Some of these cells contained a few granules showing a chromatin tint. Myelocytes were not in evidence, nor did the blood films suggest lymphatic leukæmia. The red blood cells numbered 2,250,000 per cubic centimeter, and the white blood cells 8,000 per cubic centimeter. Blood culture was carried out, but yielded no results as regards the presence of a septicæmia. Puncture of the spleen was then resorted to. This organ was very firm, and resisted considerably the entrance of a fine hypodermic needle. Several smears were carefully examined, but neither Leishman-Donovan bodies nor malarial parasites were ever found.

As the spleen continued to enlarge and the patient's condition showed no improvement, the operation of splenectomy was decided upon, and successfully carried out by Dr. Atkey, of the Sudan Medical Department. The operation wound healed satisfactorily, but the patient's temperature continued to rise steadily, and was in no way influenced by quinine administered hypodermically. An examination of the fæces was then carried out after a purge had been given; it may be mentioned that since her admission the patient had not shown any signs of intestinal irritation. After a prolonged search the ova of *Schistosomum mansonii* were found.

The patient's physical condition did not improve, and it was noticed that the liver was now commencing to enlarge rapidly. As a possible line of treatment vaccine therapy was suggested. A sample of the fæces was obtained and suitably plated out, and a bivalvent vaccine prepared from two different types of *coli* organisms isolated. An injection of 250 million was given as an initial dose, followed four days later by an injection of twice the number of micro-organisms, and a similar number a week following the last dose.

The patient's temperature after the third injection became consistently lower. Another sample of fæces was obtained, and almost a pure culture of a *proteus*-like organism obtained. A fresh vaccine from this was prepared, two injections were given, and at the end of a week the patient had improved considerably, and a week later was discharged from hospital with practically a normal temperature. Her liver, which had previously extended to a position almost level with the umbilicus, had now retracted to a point 1 in. below the costal margin.

Conclusions.

The main points referred to in this paper may be briefly summarized.

(1) There exists a specific fever in the Sudan, acute or chronic in type, dependent on an infection with *Schistosomum mansonii*.

(2) This fever is usually accompanied by an enlargement of the spleen, a varying degree of anæmia, a polymorphonuclear leucocytosis, a large lymphocytosis, and an absence of eosinophilia. In the more chronic cases the liver becomes enlarged.

(3) Intestinal symptoms may or may not be present.

(4) The importance of a careful examination of the fæces in all cases of pyrexia of uncertain origin.

(5) The possible value of treatment by autogenous vaccines of intestinal organisms, particularly in the acute toxic types of intestinal schistosomiasis, and in cases of splenomegaly due to no apparent cause.

Thanks are due to Captain A. G. Cummins, R.A.M.C., for the clinical notes of Cases 1, 2, and 3, and to Dr. Atkey and Dr. Christopherson, of the Sudan Medical Department, for facilities given in the treatment of Case 4. Mr. Newlove, of the Khartoum Civil Hospital, also rendered kindly assistance.

Drugs and Appliances.

PHYSIOLOGICAL CRITERIA FOR MEDICINAL SUBSTANCES.

The testing of medicines constitutes one of the most important and practical branches of modern scientific research work, and deserves even more attention than has hitherto been accorded to it. It is a task which has been shown by experience to pass outside the self-imposed limits of ordinary analytical chemistry, and it is therefore especially interesting to note the contributions which have been made, during recent years, to this branch of study, by specialists in physiology and bacteriology.

The pamphlet recently issued by the Wellcome Physiological Research Laboratories under the above title admirably epitomizes current practice and gives some extremely interesting reports, illustrating the progress made towards the ideal of precise physiological standardization of potent medicines.

In choosing a physiological test, the method pursued at the laboratories has been to select one definitely related to the therapeutic effect of the drug, or, when the active principle is known, to use that one of its actions which produces an easily measurable effect. A rise of blood-pressure, or the minimal lethal dose for animals of uniform weight, are examples of data susceptible of accurate measurement, and therefore suitable for establishing an exact system of dosage.

The application of the lethal dose method to the digitalis series is described in some detail. The testing of tincture of digitalis is carried out by means of the common English frog (*Rana temporaria*), the heart of a medium sized specimen coming to a complete systolic standstill within three hours when the frog is injected with a dose of 0·0075 c.c. of the standard tincture per gramme of body weight. Theoretically equivalent specimens of tincture and other preparations of digitalis, as ordinarily purchased on the market, have been found to vary in activity in the proportion of 1 to 4, when tested by this method, and the extreme importance of maintaining a physiological standard in regard to so potent a drug is therefore obvious. The frogs used should be freshly caught; healthy males of about 25 grm., during the months of July and September, give the most uniform results. The curious fact is noted that the toad, which Shakespeare described as "ugly and venomous," possesses a secretion of the skin, digitalis-like in its action. Being remarkably resistant to the drugs in this series, toads are unsuitable for testing the activity of digitalis. Some interesting tables showing the results of doses of the tincture of digitalis, squill and strophanthus upon frogs of known weight are given, and the method of deducing an average minimal lethal dose is indicated.

Cannabis indica being a drug of very variable activity, of which the active principle, although known, does not lend itself to chemical methods of standardization, has furnished another field for physiological research.

The various methods which have been suggested for standardizing preparations of the suprarenal gland are next discussed.

Adrenine is a notoriously unstable substance, and neither the optical rotation test nor the chemical estimation methods hitherto devised have proved suitable for routine standardizing purposes. It has remained for the physiologist to devise a test, and this has been done by measuring the rise of arterial blood-pressure produced upon an animal organism as the result of an intravenous injection. Pithed cats under artificial respiration are utilized for this purpose, and the method, as stated by an observer, is found to be capable of the mechanical accuracy of a chemical balance. Some instructive diagrams illustrating this part of the subject are given.

A noteworthy example of the fruitful alliance between chemical and physiological methods in the examination of medicinal substances is to be seen in the production of "epinine," which was the outcome of independent investigations at the Wellcome Chemical Research Laboratories. Owing to its synthetic origin and the fact that its salts are readily crystallizable, this substance can be prepared in a state of uniform purity which precludes the necessity for the constant repetition of physiological tests. In its therapeutic effects it closely resembles the suprarenal active principle.

Pituitary (Infundibular) Extract, which has attained in recent years a wide therapeutic importance, is a preparation, the chemistry of which is by no means in so advanced a state, and here the need for exact physiological criteria is specially apparent. Such data are obtained at the Wellcome Physiological Research Laboratories by measuring the action of a batch of pituitary extract upon the isolated uterus of a virgin guinea-pig, suspended in warm oxygenated Ringer's solution, a method which excludes the errors due to tolerance of successive doses in animals.

The remainder of the book is devoted to the elucidation of the complex but deeply interesting problems connected with ergot and its standardization.

"Physiological Criteria" should be read by all who desire to obtain an insight into modern methods of the physiological control of drugs, and it abundantly demonstrates not only the importance of this work but also the thorough and scientific manner in which it is being carried out at the Wellcome Physiological Research Laboratories.

Notes and News.

FOURTH INTERNATIONAL CONGRESS OF SURGERY.

THE Fourth International Congress of Surgery meets at New York, U.S.A., from April 13 to 18 in the Hotel Astor. The s.s. *Imperator*, of the Hamburg-America Line, leaves Southampton on April 8, reaching New York on the 9th. Special rates are being charged for delegates proceeding to the Congress by this ship, a 25 per cent. reduction being allowed off the tariff rates. Tickets are available for the return journey up to May 15 from New York.

BRITISH MEDICAL ASSOCIATION.

EIGHTY-SECOND ANNUAL MEETING, ABERDEEN, 1914.

President-Elect: SIR ALEXANDER OGSTON, K.C.V.O., M.D., LL.D.

Section of Tropical Medicine.

President.—Professor William John Ritchie Simpson, C.M.G., M.D., 31, York Terrace, Regent's Park, London, N.W.

Vice-Presidents.—Daniel Elie Anderson, M.D., F.R.S.E., 26, Harley Street, London; John Mitford Atkinson, M.B., 37, Welbeck Street, London, W.; Henry Fraser, M.D., Kuala Lumpur, Federated Malay States.

Hon. Secretary.—George Alexander Williamson, M.D., 15, Forest Road, Aberdeen.

Notices to Correspondents.

1.—Manuscripts if not accepted will be returned.

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5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

"A HUMAN RECOVERY FROM TRYPANOSOMIASIS."

By Dr. T. S. KERR.

Late P.C.M.O., Straits Settlements.

To the list of recoveries from trypanosomiasis the following case may now I think be added:—

Mrs. G., aged 45, seen with Dr. E. I. Spriggs for the first time November 5, 1909.

The patient had just arrived from an upstation in Portuguese Loanda, where she had lived for fifteen years, coming home occasionally to Europe.

During the earlier years of her stay she suffered much from malaria. She remembers specially being bitten by a tsetse-fly some time in June, 1909, after which she had a wetting followed by a fever on which quinine had no effect. Later a rash appeared all over the body in circular patches, varying in size from a sixpenny piece to a half-crown, which the Portuguese doctor called eczema: it disappeared after a time.

Getting no better she left for England, arriving in London October 28, 1909.

On examination patient states she does not feel well but is not sleepless nor irritable, and has now no fever, but is much depressed. She is pale and has an anxious look, but there is no marked anæmia nor emaciation. On the left side of the neck several glands are palpable, one markedly so in the posterior triangle. The axillary and inguinal glands are enlarged. The spleen is palpable. There is an indistinct mottling on the left upper arm, the patches being irregular in shape and of a reddish tinge.

There is an eczematous condition of the skin of the left leg where formerly there had been an ulcer. Deep hyperæsthesia (Kerandel's sign) is well marked. There had been much sleeping sickness among the estate coolies, some of whom she had nursed.

The case was diagnosed provisionally as one of trypanosomiasis, and this was confirmed by the finding of trypanosomes in the blood.

A blood examination made on November 5 was as follows:—

Reds	4,175,000
Whites	3,960
Hæmoglobin	86 per cent.
Differential Count:—	
Polynuclears	48·5 ,,
Large mononuclears	13·0 ,,
Lymphocytes	30·5 ,,
Eosinophiles	8·0 ,,

Two trypanosomes were found whilst making the differential count.

Examination of the fæces was negative.

Treatment.—Intravenous injections of tart. antim. were proposed, but as the effect of these was then little known the following treatment on the advice of Sir Patrick Manson, who saw the patient, was adopted.

(1) Intramuscular injections of soamin every fourth day beginning with one grain, increased gradually to three grains.

(2) Sodium antim. tart., ½ gr. in 10 oz. of water to be taken in the twenty-four hours mixed with her food, the amount to be gradually increased to 2 gr. in the twenty-four hours.

(3) Plain food, cod-liver oil, and open-air exercise daily short of fatigue. She was admitted to Netley House, November 14, 1909, and treatment was commenced on the 15th. Her weight was then 9 st. 11 lb. There was only a very slight rise of temperature (see chart), but the pulse was rapid and easily excited.

On the 16th she developed a cyclitis and iritis of the right eye, and subsequently severe conjunctivitis which gradually yielded to a lotion of zinc sulph. and atropine. By the 24th she was having 3 gr. injections of soamin and daily ¾ gr. of sodium antim. tart., which occasioned no inconvenience; she was also feeling much better then, had a good appetite, and had been out for a drive. The rash was almost inappreciable, the glands diminished

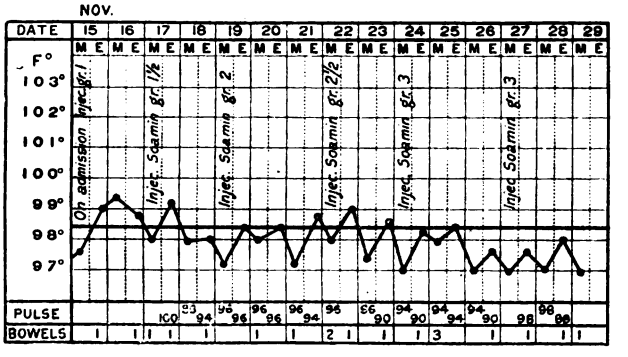


CHART A.

and the eye became much better. She complained only of occasional fleeting pains in the forearms and calves of the legs.

By the 28th she could take 1 gr. of the antimony salt daily and was able to go out for a walk, was more cheerful, ate and slept well; had crampy feelings in the hands, though very evanescent; eye now quite well. Left the home November 29. By December 14 she was taking 2 gr. of the antimony salt but complained of occasional nausea, griping pains, and diarrhœa; felt much stronger.

Of the eruption there was now no trace, and some of the enlarged glands had entirely disappeared; others were barely palpable. No trypanosomes could be found in the blood. The antimony was decreased for a day or two and then resumed. A week later she complained of fleeting pains of a neuralgic character about her temples, cheeks, arms, legs, ankles, and had frequent flushings.

December 29, beyond fleeting pains in legs and about hands, and these less than formerly, had nothing to complain of; the heart's action was not so rapid, the spleen was no longer palpable, nor

could the glands, except those in the left axilla, be felt.

Differential blood counts made on November 5 and 26 and December 15 gave the following:—

	Nov. 5, 1909. Per cent.	Nov. 26, 1909. Per cent.	Dec. 15, 1909. Per cent.
Polymorphonuclears ...	48·5	46·0	43·0
Large mononuclears ...	13·0	12·0	6·0
Lymphocytes	30·5	33·0	39·0
Eosinophiles	8·0	9·0	12·0

The patient left for West Prussia in the beginning of January, 1910.

On March 5 she wrote saying she had had three attacks of fever recurring every forty-eight hours; they were similar to others experienced on returning from Africa on previous occasions. From the description these appear to have been of a malarial nature, so quinine was ordered.

Blood films taken just after the fever and examined by me on the 8th showed neither malarial parasites nor trypanosomes.

The glands she stated had quite disappeared, but occasionally she experienced tingling sensations about the face and irritation about the neck, shoulders and upper arms, but "felt well in mind, healthy in spirits and really enjoyed life." Weight 10 st.

March 11, 1910.—Written to, to continue treatment. On April 13 she wrote, "I suddenly seem unable to stand my antimony; I have been taking regularly two "tabloids" (2 gr.) in 10 oz. of water, but for the last two weeks have suffered much discomfort and feel generally unwell, sickness, pains in the stomach, and diarrhœa."

"The continued discomfort pulls me down very much. I have also queer pains in my hands, wrists and ankles, but no other symptoms that cause me uneasiness and no return of the malaria."

April 20.—Written to, to omit antimony for ten days, then to begin again with $\frac{1}{4}$ gr. to 10 oz. of water, to be gradually increased to 2 gr.: to continue soamin injections.

All disagreeable symptoms passed off on stopping the antimony for ten days. In four blood slides taken after stopping the antimony no trypanosomes were found.

Patient returned to London, June 1, 1910. Stated she felt very well but had stiff feelings about the knees after sitting for a long time, and six weeks ago had a mild attack of conjunctivitis. With occasional variations has now taken daily $1\frac{3}{4}$ gr. of antimony and soamin injections 3 gr. every fourth day for five months. No eye symptoms, spleen not palpable, no enlarged glands, heart's action still a little rapid, eczema of the left leg quite disappeared.

Patient looked well, colour and complexion good.

On her return to Germany on June 16 I suggested she should see Prof. Schilling at Berlin, to whom I sent an account of her case. She saw him on June 20.

She reported that her eyes had been examined by a specialist and that they were quite normal. Is getting fatter daily and in the best of spirits, though still troubled occasionally by the antimony.

October 8, 1910.—Patient again in London. Has continued the injections of 3 gr. of soamin every fourth day since November 15, 1909, and the sodium antim. tart. daily (500 1-gr. "tabloids" in all).

She has had occasionally to vary the amount taken, for when the dose reached 2 gr. a day it induced pain, nausea and diarrhœa, and she had to desist for some days and begin again with $\frac{1}{2}$ gr. doses.

Lately has experienced dull feelings in the head after the injections, which, however, soon pass off.

Unless when taking the antimony in large doses, the bowels kept regular and she was free from pain. No extraordinary sensations, eyes normal, no enlarged glands, weight 10 st. 13 lb.

Injections were then reduced to 3 gr. every five days, antimony to $\frac{1}{2}$ gr. daily.

In April, 1911, when in Germany, signs of an eruption again appeared. Treatment was therefore stopped for three weeks, the temperature was taken daily, and at the end of this period 20 c.c. of the patient's blood was injected into a monkey, by Professor Schilling.

The monkey died, and at the *post-mortem* examination showed a much enlarged spleen with

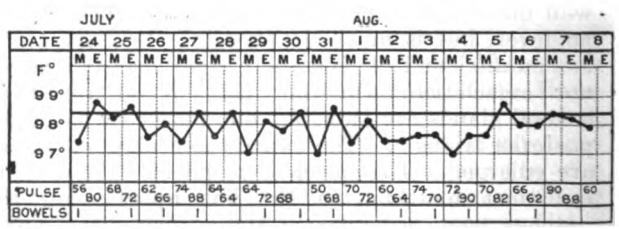


CHART B.

Temperature chart while having the antimony injections.

trypanosomes present there and in the bone marrow. Sub-inoculated rats also acquired the disease. At this time the patient wrote to me saying, "I have not been so strong for years; can play six sets of tennis of a morning and take a walk in the afternoon."

On July 17, 1911, the patient returned to London and, in view of Kerandel's experiences just then published, it was decided to try intravenous injections of tartar emetic, beginning with $\frac{1}{2}$ gr. doses to 6 oz. of saline every third day until seven injections in all had been given, gradually increasing the dose and resuming the soamin injections as formerly.

These injections were given by Dr. E. L. Hunt, and considerable difficulty was experienced in giving them owing to the very small calibre of the veins.

The first injection, $\frac{1}{2}$ gr., was given on July 24, 1911, and was followed by no symptoms. Injection of soamin.

The second on the 26th was unsuccessful, but on the 28th 1 gr. was injected; this was followed by cough and a slight rise of temperature lasting two to three hours.

July 31.—Third injection, 1·25 gr. No after symptoms: soamin 1 gr.

August 2.—Fourth injection, 1·5 gr. No after symptoms.

August 4.—Fifth injection, 1·5 gr., followed by slight cough. The patient stated that after each injection she experiences a curious taste in her mouth, like that of blood.

August 6.—Sixth injection, 1·75 gr. It was intended that 2 gr. should be given, but when 1·75 gr. had been injected coughing began. This injection was followed in about two hours by neuralgic pains in the shoulder and arm of the side injected, but these soon passed off.

August 8.—Soamin injection, 2 gr. Feels well. Weight 11 st.

August 9.—Seventh injection, 1·75 gr. This was followed by coughing and some hours later by dreadful feelings of heaviness and pains in the arms and legs so that she had difficulty in moving, but by mid-day of the following day they had quite disappeared and she was able to go home.

On August 23, fourteen days after the last injection, six white rats were injected intraperitoneally, each with 1½ c.c. of the patient's blood. On September 24 one of the rats died suddenly from no assignable cause, but no trypanosomes were found in its blood or spleen.

When seen on October 9 patient stated, "I am very well and enjoy life thoroughly; am able to take any amount of exercise without fatigue, eat well and sleep splendidly. Have occasionally neuralgic feelings about eyes. Weight 11 st. 10 lb."

The 3 gr. injections of soamin which had been continued every fourth day since August were discontinued on October 14 as there was some redness around the eyelids and irritation of the skin, particularly of the parts lain upon.

On November 13, 1911, patient complained of pains in eyebrows and at back of ears radiating down the neck and felt very nervous in consequence. Examination of her blood was negative and there was neither eruption, enlarged glands nor other symptoms attributable to trypanosomiasis.

She then returned to Germany again and saw Prof. Schilling at Berlin. He found her well but apprehensive of a return of the disease.

He inoculated a second monkey with 20 c.c. of the patient's blood on November 27, 1911. This monkey, which remained well, was killed on January 12, 1912, and no evidence of trypanosomes in the blood or organs either in fresh or stained preparations were found.

Another monkey was inoculated in the beginning of March and died in about four weeks quite suddenly, but the autopsy showed nothing that would point to a trypanosome infection. Further treatment was then abandoned.

Since that time the patient has remained well ever since, and wrote on August 20 and again on December 23, 1913, saying that she was in perfect health.

The points of interest in the case are—

(1) The high eosinophile count, not usual in trypanosomiasis, though helminths were absent.

(2) The extraordinary good health enjoyed by the patient in spite of the persistence of the infection. On June 16, 1911, two years after the initial infection, she was playing tennis daily. This was, I think, attributable to the tonic effect of the soamin.

(3) The large amount of antimony taken internally.

(4) The curative effect of the intravenous injections of tartar emetic.

(5) Whether the course of soamin injections and antimony by the mouth during eighteen months rendered more effective the subsequent intravenous injections of antimony is a matter for conjecture; unquestionably they did her much good, but there can I think be little doubt that the intravenous injections were the active remedial agent and caused the disappearance of the trypanosomes.

(6) Symptoms having now been absent for so long point, I think, to a real recovery from the disease and not merely to an arrest of its progress.

A FURTHER CASE OF ENTOPLASMOSIS.

By Aldo Castellani, M.D.

Director Government Clinic for Tropical Diseases, Colombo (Ceylon).

In a paper published by me in The Journal of Tropical Medicine and Hygiene, March 1, 1914, I described a peculiar protozoal organism found in three cases of dysenteric colitis in which amœbæ and bacilli of the dysentery group were absent. Since then I have come across another case, a passenger from Burma. The patient complained of severe griping pains and diarrhœa, with mucopus and blood in the stool. These symptoms had started two days previous to my seeing him on board ship. The temperature was 100° F., general condition good; the stools contained a large amount of mucus, practically no fæcal matter. I prescribed a saline mixture, and directed the patient to pass a stool into a large sterile Petri dish with which I supplied him. This was examined microscopically thirty minutes after having been passed, and protozoal bodies identical to those described in my previous report were found. There is no necessity to give a full description of them again here, but I may mention that the bodies were actively motile with the body showing only slight changes of shape while moving and no pseudopodia and with the anterior portion extremely shaken, so to speak, by very rapid vibratory-like movements, making one suspect at once the presence of flagella. On closer examination no such structures were found, either in fresh or stained preparations. In this case, in addition to the Giemsa method of staining, I employed the Heidenhain Iron Hæmatoxylin, with, of course, previous wet fixing. One preparation so stained came out beautifully, showing clearly that the group of granular or coccus-like bodies observed in preparations stained with Giemsa is a nucleus, this confirming Professor Mesnil's and my own opinion. No flagella or cilia were visible. Of course, I do not deny that such organs may be present, but so far in none of my preparations have I been able to detect them, nor have any of my colleagues to whom I have shown the slides and the fresh preparations. How to classify this organism?

Professor Mesnil and some other authorities who have seen it consider it a new organism, but differ in the zoological position which should be given to it. Personally, I consider it to represent a new genus, for which I proposed in my previous paper the term "Entoplasma."

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

March, 1914.

No Deaths. No Transfers.

Resignations. — A. Hipwell, L.R.C.S., L.R.C.P.Ireland, D.P.H.Liverpool, D.T.M.Liverpool, Medical Officer, Nigeria; F. G. Thompson, M.B.Lond., Medical Officer, Gold Coast.

Retirement.—G. C. Walker, M.D., Ch.B.Vict., M.R.C.S.Eng., L.R.C.P.Lond., L.S.A.Lond., D.P.H.Lond., D.T.M.Liverpool, Sanitary Officer, Gold Coast, retires on pension.

New Appointments. — The following gentlemen have been selected for appointment to the Staff: W. Telfer, M.B., Ch.B.Glasgow, Gold Coast; J. F. Corson, Ch.B., M.D.Manchester, D.P.H.Cantab., Gold Coast; H. Fleming, M.B., B.Ch., B.A.O.Dublin, Sierra Leone; W. Allan, M.B., Ch.B.Aberdeen, D.P.H., Sierra Leone; W. H. Kauntze, B.A.Vict., M.B., B.Ch.Vict., M.B., B.S.Lond., M.R.C.S.Eng., L.R.C.P.Lond., Nigeria; A. R. Paterson, M.B., Ch.B.Glasgow, Nigeria; R. G. Ball, B.A.Dublin, M.B., B.Ch., B.A.O.Dublin, Gold Coast; E. J. H. Garstin, B.A.Dublin, M.B., B.Ch., B.A.O.Dublin, Nigeria; P. A. Clearkin, M.B., B.Ch., B.A.O.Queen's University, Belfast, Sierra Leone; J. McC. Clark, M.B., B.Ch.Aberdeen, D.T.M.Liverpool, Sierra Leone; J. Atkinson, M.B., Ch.B.Glasgow, Gold Coast.

Other Colonies and Protectorates.

J. L. Pawan, M.B., Ch.B.Edin., and H. C. Swertz, M.B., B.Ch., B.A.O.(R.U.I.), have been selected for appointment as Supernumerary Medical Officers in Trinidad.

T. H. Massey, L.R.C.S., L.R.C.P.Ireland, has been selected for appointment as a Medical Officer in the East Africa Protectorate.

M. Anthony, L.R.C.S., L.R.C.P.Ireland, has been selected for appointment as Second Assistant Medical Officer, Lunatic Asylum, Jamaica.

A. H. B. Pearce, L.R.C.S., L.R.C.P.Edin., L.F.P.S.Glasgow, L.M.Dublin, Medical Superintendent of the Holberton Hospital and Health Officer, Antigua, has been selected for appointment as Colonial Surgeon in the Falkland Islands.

J. F. Hoare, M.R.C.S., L.R.C.P., has been selected for appointment as a Medical Officer, Gilbert and Ellice Islands.

J. G. Watson, M.R.C.S.Eng., L.R.C.P.Lond., has been selected for appointment as Medical Officer for Grand Cayman.

W. S. Mitchell, M.R.C.S., L.R.C.P.Lond., L.S.A., has been selected for appointment as Assistant Resident House Surgeon at the Colony Hospital, Grenada.

J. T. Duncan, F.R.C.S.Ireland, has been selected for appointment as a Medical Officer in the Straits Settlements.

G. V. Fiddian, M.B., B.C.Cantab., has been selected for appointment as an Assistant Medical Officer in British Guiana.

J. M. Mackinnon, M.B., Ch.B.Edin., has been selected for appointment as a Temporary Medical Officer in the East Africa Protectorate.

B. C. N. O'Reilly, M.R.C.S.Eng., L.R.C.P.Lond., and E. E. Wilbe, L.S.A.Lond., have been selected for appointment as Medical Officers in the Gilbert and Ellice Islands.

S. D. Stewart, M.B., Ch.B.Edin., has been selected for appointment as a Supernumerary Medical Officer, Trinidad.

G. H. Lewis, M.D.Edin., and C. W. L. Cassel, M.B., Ch.B.Edin., D.T.M.Liverpool, have been selected for appointment as Assistant Medical Officers, British Honduras.

H. B. Dodds, L.R.C.P., F.R.C.S.Ireland, Medical Officer, St. Vincent, has been selected for appointment as a Medical Officer in the Straits Settlements.

Notices.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MARCH 16, 1914.

HELMINTHOLOGICAL INVESTIGATIONS.

THE departure of the expedition, under the direction of Dr. R. T. Leiper, Helminthologist of the London School of Tropical Medicine, to the Eastern Tropics is an event which must prove of considerable scientific importance. Accompanying Dr. Leiper is a medical officer seconded by the Admiralty, Surgeon E. L. Atkinson, R.N., who, since his return from the Scott Antarctic Expedition, has been working at the London School of Tropical Medicine upon pathological specimens he brought back from South Polar regions. The personnel of the expedition is further perfected by the presence of a zoologist,

Mr. A. Cherry-Garrard, who served as Assistant Zoologist in the late Antarctic Expedition. The funds necessary for the investigation have been found partly from the bequest of the late Lord Wandsworth to, and now under the control of, the London School of Tropical Medicine, and partly they have been contributed to by the Tropical Diseases Research Fund of the Colonial Office.

The primary object of the expedition is to ascertain the mode of spread of the trematode diseases of man.

Facilities for investigation have been afforded by several countries, and in Sumatra the United States Rubber Co. have specially invited the expeditionary party to study the helminths as they affect the workmen on their rubber estates.

In a previous leader in this Journal we drew attention to the solidarity of scientific investigation, citing as an instance the bearing Arctic and Antarctic pathological and zoological findings had on our geographical knowledge of the spread of disease, and of the limitations or otherwise of pathological germs by heat and cold. The association of experts with a first-hand knowledge of these subjects in the frigid zones is of particular interest on the occasion of this the most recent scientific expedition to the Tropics.

The intestinal parasites met with in man in the Tropics might well be termed legion, and no medical practitioner who deals with tropical ailments at home or abroad can afford to do aught as a first and stereotype item of practice but to administer an anthelmintic, or at least a simple purge, so as to ensure that there is no worm or its ova complicating the symptoms of any one of the intestinal derangements that may come to him for treatment. How often even the most skilful doctor in the Tropics has had cause to repent the non-observance of this practical axiom. Intestinal fluxes ascribed to dysentery, acute, chronic or intermittent sometimes prove intractable to the customary remedies for dysenteric lesions, and the cause of the resistance to their action is not detected until the patient goes to another doctor, who, administering an anthelmintic, clears up the mystery, to the chagrin of the aforesaid and the loosening of the unflattering tongue of the sufferer. Apart, however, from the mere clinical aspect of the good this expedition may do, there are larger and more important factors to be considered, namely, the public health and the commercial points of view. These are intimately associated. The good health of the workers in a mine, on a rubber, tea or coffee plantation, or on any commercial undertaking where men are employed in large numbers, affects the commercial value of the undertaking they are engaged upon to the extent that it may have to be abandoned by the capitalist owing to the monetary losses ill-health entails. Such a state of things affects the whole world by the fact that many necessary articles of food become dearer not only locally, but universally, and the tea, coffee, cocoa, sugar, rice, tapioca, sago, &c., of our ordinary diet is enhanced in price. Thirdly, the scientific advance likely to ensue from the expedition may be hoped to be great and lasting. The men engaged upon it have a high scientific reputation and their work is sure to be sound and reliable. It is to be hoped that our knowledge of bilharziosis will be advanced, that ankylostomiasis will be rendered more capable of being controlled, and that the flora of the intestine generally will be placed on a surer footing than obtains at present.

SUBCUTANEOUS INJECTIONS OF QUININE.

The condemnation of relying upon hypodermic injections of quinine in the treatment of malaria has been from time to time insisted upon in the pages of this Journal; the surgical disadvantages were frequently brought prominently forward, and the therapeutic value was decried. Time was, and that but a few years ago, when a practitioner of medicine who refused to give hypodermics of quinine in severe malaria was looked upon as old-fashioned and not in harmony with the scientific advances of the day. After a lack of wisdom in these matters there is nowadays a general outcry against quinine being so given. Captain MacGilchrist, I.M.S., in an article published in the *Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India*, as long ago as 1911 (No. 41 *Memoir*) stated "that quinine and its salts are fundamentally unsuited for hypodermic use." In No. 43 of the same *Memoirs*, 1911, Colonel Sir David Semple, R.A.M.C., brought home to us the danger of tetanus occurring from these injections; and now Sir Ronald Ross, K.C.B., F.R.S., states that "I really do not know why this form of medication is continued in malaria." He further states (*Medical Times*, March 7, 1914): "It appears to me that the only cases in which intramuscular injection is called for are those in which intestinal absorption may be checked by very marked intestinal affections, or where patients are not to be persuaded to take the drug by the mouth at all. For severe cases, to judge by the experimental evidence, the subcutaneous injections are much worse than useless, because the patient may really not be absorbing any of the drug just at the critical moment when it is necessary that he should absorb a large quantity; and I fancy that a considerable number of the fatal cases are due to this. Where the drug cannot be given by the mouth in very severe cases, the intravenous injection in extreme dilution seems to be much preferable to the intramuscular one. I am aware that opposite opinions have been cited, but do not think that their weight is sufficient to convince us."

Surely, therefore, we shall hear no more of quinine being given hypodermically by British practitioners. Hypodermic medication for many complaints has come to us from France, and we cannot hope to find that the French practitioner will recede from his position, but let us hope that experience will teach us to give up a method of administering quinine which never had anything to recommend it.

Annotations.

Natural Leishmaniasis of Dogs in Algiers (Lemaire, G., Sergent, Ed., and Lhéritier, *Revue Médicale d'Alger*, January, 1914).

In this paper the authors describe the kala-azar of dogs as it occurs naturally in and around Algiers. On the subject of the period of incubation no definite statistics are available on account of the difficulty of making a diagnosis in dogs at the early stages of the disease. The disease is described as occurring in three types—the benign infection, the infection of medium intensity, the acute infection.

Benign Infection.—Dogs show no wasting and to all appearance are in good condition. In smears of the organs leishmania either cannot be detected or are present in very small numbers. In some cases leishmania can only be demonstrated by inoculating bone-marrow into tubes of N.N.N. medium.

It is not an uncommon thing to find, in and about the homes of cases of human kala-azar, dogs which have at some time or another emaciated and lost their fur, but which later have recovered and appear quite healthy again, save that in certain cases there remain lesions of the eyes, and ulcerations about the eyes, nose and ears. It may be quite impossible either by microscopic examination of smears or by culture in N.N.N. medium to demonstrate leishmania, yet the authors feel convinced that such cases are really ones of canine kala-azar of a mild type, and that a complete recovery is usual.

Medium Infection.—This is the most common type and generally ends in death after a year or sixteen months. Animals in this condition show a progressive emaciation, there is great muscular weakness, especially of the hind limbs, as shown by the unwillingness of the animal to stand. The fur is lost in patches and may come off so completely that the body is denuded. Ulcerations at the angles of the mouth and eyes and on the nose are common, while keratitis with opacity of the cornea is fairly frequent. The animal's appetite is good till near the end, which is often preceded by a period of hypothermia and several attacks of diarrhœa. In these cases *post-mortem* the spleen may be soft and hypertrophied or more firm and hard, according as to whether the animal has or has not lived long enough for a terminal sclerosis to develop. A similar sclerosis of the liver may occur at a later stage of the disease. The bone-marrow is always red in colour. Keratitis, as already stated, is common in the canine kala-azar, and this is a form of intestitial keratitis due actually to a development of leishmania in large cells in the cornea itself.

Acute Infection.—In this type of disease there is a rapid emaciation without any other sign to lead one to a diagnosis, which can only be made by the actual finding of the leishmania in the organs. The leishmania occur in extraordinary numbers, so much so that the normal cells of the organs infected seem to be actually forced away by the parasites themselves. Animals suffering from the acute disease die in a few weeks.

Equine Piroplasmosis in Italy.—In the *Centralblatt für Bakteriologie* for February 11, 1914, Matteo Carfano has two papers on equine piroplasmosis in Italy.

In the first of these are described two piroplasms which occur in horses in Italy. One is the small (typus parvum) variety, and named by França (1909) *Nuttalli equi*, while the other, belonging to the large (typus bigeminum) variety, was first distinguished by Nuttall as *Babesia caballi*.

Nuttalli equi is very difficult to observe in the living condition, but this can best be done by means of dark-ground illumination.

In stained preparations various types are seen.

Granule Forms.—These consist of a chromatin mass 0·5 to 1 micron in diameter, with or without a faint protoplasma layer round it. Morphologically, these forms are identical with *anaplasma ring forms*. They vary in size from 1 to 2 microns, and are round or oval in outline, and consist of protoplasm with central vacuole, and one, or even two, chromatin masses of varying size.

Pyriform Forms.—These are pear-shaped and of varying size, and may be arranged in pairs in the red cells. They can, however, always be distinguished from the pyriform individuals of *Babesia caballi*.

Amœboid Forms.—Others are irregular in shape, and may have several long, thin pseudopodia resembling flagella.

Reproduction takes place in the blood corpuscles by a division of the parasite into four merozoites after four chromatin masses have been produced. This division gives rise to a characteristic cross appearance produced by the four merozoites attached by their pointed ends.

Babesia caballi, the large piroplasm of the bigeminum type, is less frequently encountered than *Nuttallia equi*. Morphologically, it very closely resembles *Babesia bovis* of cattle and *Babesia canis* of dogs, and is characterized by its large size and the constant occurrence of pyriform parasites arranged in pairs in the red cells. Round and amœboid forms are also commonly seen, while reproduction occurs by division in two. Cases of multiple infection of the red cells appear to be due to repeated transverse divisions.

In Italy horses are infected with two ticks—*Rhipicephalus bursa* and *Boophilus annulatus*, which are probably responsible for the transmission.

That these two piroplasms of horses are distinct can be proved by inoculating with one an animal which has recovered from and become immune to the other.

In the second of the papers the author describes the artificial culture of these parasites in blood mixed with a solution of sodium chloride and sodium citrate. In this medium *Babesia caballi* survives alive for for many days, but does not appear to

reproduce. On the other hand, *Nuttallia equi* reproduces as in the blood by division, and ultimately leads to the formation of the small anaplasma forms which are to be regarded as stages of resistance, and occur in other forms of piroplasma also. It is to these forms that the author ascribes the frequent relapses which occur in infections with *Nuttallia equi*.

Trachoma.—In the *Archives de l'Institut Pasteur de Tunis* (iii-iv, 1913), Nicolle, Cuénod and Blaizot give an interesting and important review of work that has been conducted in their institute upon the subject of trachoma.

In experimental work of this kind the great essential is to have some animal which is susceptible to the disease. For a long time the only one which would contract the disease was the chimpanzee, an animal difficult to procure. They discovered, however, that the monkey of Algeria—*Macacus inuus*—was also susceptible, and with this animal experiments were undertaken. Inoculation is best made by scarifying the conjunctiva with an instrument which has been contaminated with a virulent virus. For eight days after this there is no noticeable change in the eyes. Then the conjunctiva becomes red and œdematous, and on the fourteenth day typical granulations appear on the upper lid near the border of the tarsal cartilage. Thence the injection spreads and eventually involves the lower lids also. During the third and fourth weeks the appearance is quite typical of the disease. After a period during which no change occurs the condition improves till finally after three months a complete recovery has resulted. It is possible to inoculate from one monkey to another.

Bertarelli and Cecchetto succeeded in infecting a *Macaous cynomolgus* by means of a virus filtered through a Berkefeld filter. This experiment the writers of the paper under review have repeated upon two *Macacus inuus* in one experiment and upon a chimpanzee and another *Macacus inuus* in a second. In each case a positive result was obtained, so that they are justified in concluding that the agent of trachoma is a filtrable microbe which is invisible, since most careful microscopic examination has failed to reveal it.

By an exposure of the virus to a temperature of 50° C. for thirty minutes it is destroyed, and similarly it ceases to be inoculable after drying for thirty minutes at 32° C. In glycerine the virus is still virulent after seven days in the ice-chest.

By a series of inoculations it has been shown that the virus is virulent from whatever stage of the disease it is taken, and that the smallest particle of conjunctival tissue, or even the tears, are able to reproduce the disease in susceptible animals. The onset of trachoma is insidious and is unaccompanied by any inflammatory condition of the conjunctivæ or secretion in its early stages.

One attack of the disease confers upon the monkey an immunity against subsequent injection, and further there is some evidence to show that repeated intravenous injections of virus may render a *Macacus inuus* immune to subsequent conjunctival inoculation. As a result of these experiments upon the monkey, attempts have been made to treat human beings by intravenous injections of the virus. This was done in ten cases with no result in three, improvement in five, and decided beneficial action in two, which was all the more marked in one of these since the case had been most resistant to other treatment.

Another line of treatment has been adopted and this is the subconjunctival inoculation of the scrapings of the infected eyelids of the patient himself. From November 15, 1912, to May 15, 1913, this treatment was carried out in 154 cases, and since then it has been the routine treatment at the clinic in the Rue Larkoum. The details of these cases will be published later. They have been most encouraging and have given better results than any form of treatment hitherto adopted. The treatment is easily done. The products of curetting are taken up directly from the curette in a syringe and injected immediately under the conjunctiva of the *cul-de-sac* of the upper lid. Absorption is very rapid and never has any bad consequences. Several injections are given to each case.

Intravenous Injections of Sublimate for Tropical Malaria with Latent Sepsis (Dr. L. Deppe, Civil Surgeon, Tanga, *Archiv für Schiffs- und Tropen-Hygiene*, No. 2, January, 1914, p. 51).—In malarial districts the laity are inclined to designate a "fever" as malaria, frequently using both words for identical things, in the same way that, in a case of fever with a positive parasitic finding, it is difficult for the medical man to ascribe it to any cause other than malaria. And, even when one considers that the various manifestations of malaria have not yet by any means been cleared up, malaria may accidentally accompany a disease from which it is frequently difficult to separate it. It is only subsequently that perchance some change in treatment may bring conclusive evidence or confirmation of another diagnosis. In this sense a case which was not cleared up may perhaps be of interest.

Mrs. T., aged 30, had measles, scarlet fever, and meningitis as a child, and a nervous breakdown at 18, which only responded to treatment after six months' sojourn in an institution. She had been ten months in the Tropics and had escaped malaria. Was supposed to have carefully followed prophylactic measures, but acknowledged, after detailed inquiries, that she had had frequent slight attacks of fever, always about midday, but had felt relatively well during them. When in D., three weeks previously, she suffered from acute rigor and fever and went into hospital. The "fever" appeared generally about 4 p.m., as is indicated by the fever-curve. Temperature rose daily to over 39° C. (102·2° F.). At D. the blood preparation was negative the first afternoon; positive at night, several medium-sized rings, described as

tropical parasites, being found; later, the blood finding was never positive again. The hospital superintendent wrote: "That it was surprising and inconceivable that, despite the continued use of quinine, there was no fall of temperature; no cause for the fever could be found. Finally, thinking it might be a case of quinine fever, the drug was discontinued. Although the fever still persisted, the observation time was too short to come to any definite conclusion." The patient spent the following week at home, without remission of fever, although quinine had been suspended. As Mrs. F. was near her confinement and very run down, her husband sought medical advice for the persistent fever on June 18. He was recommended to bring her into hospital at once.

June 19.—Patient admitted at 4 p.m.; temperature 39° C. (102·2° F.); pulse 120. No organic abnormality detected, specially no splenic enlargement. Urine free from albumin and sugar. Hæmoglobin content 80 per cent. The blood preparation showed rings claimed to be tropical. Slight pains set in at 7 p.m., which soon became stronger and more frequent.

June 20.—Waters broke 10.45 p.m. Head had entered pelvis. As the pains had become weaker, 0·5 grm. pituitrin administered at 4 a.m. without noticeable result.

June 21.—0·5 grm. pituitrin again administered in the morning without result. As the child's heart tones only registered ninety beats, even in the intervals between the pains, the patient was delivered with forceps at noon during narcosis. Perineum not ruptured. Living child, 3,500 grm., 51 cm. Back of head drawn forward as in face presentation. 0·2 grm. ergotin twice.

The temperature range was as follows:—

June 19.—4 p.m., 39° C. (102·2° F.).

June 20.—6 a.m., 36·1° C.; likewise at 8 p.m.; not taken in the interval during labour.

June 21.—6 a.m., 37·5° C.; 6 p.m., 39° C. (102·2° F.).

June 22.—6 a.m., 36·4° C.; 6 p.m., 39·5° C.

June 23.—6 a.m., 36·8° C.; 6 p.m., 40·1° C.; (104° F.).

June 24.—8 a.m., 37·8° C.; 12 noon, 40° C. (104° F.); after 0·5 grm. aspirin at 2 p.m., 37·1° C.; 6 p.m., 39·8° C.

June 25.—6 a.m. and 12 noon, 39·8° C.; 6 p.m., 40·6° C. after 0·5 grm. aspirin; 10 p.m., 37° C. (98·6° F.).

June 26.—4 a.m., 39·6° C.; 12 noon, 40° C. (104° F.); 6 p.m., 39·3° C.; after 0·5 grm. aspirin at 8 p.m., 37·1° C.

June 27.—6 a.m., 38·8° C.; 12 noon, after 0·5 grm. aspirin, 37·4° C.; 4 p.m., 39·6° C.; 6 p.m., after 0·5 grm. aspirin, 38·2° C.

June 28.—10 a.m., 40° C. (104° F.); after 0·5 grm. aspirin at 2 p.m., 37·6° C.; at 4 p.m., 40·4° C.; at 4.30 p.m., first sublimate injection; 8 p.m., 36·30° C.; 9.45 p.m., when 37° C. (98·6° F.), second injection of sublimate.

June 29.—2 a.m., 38·6° C.; at 11 a.m., when 38·2° C., third sublimate injection; 12 noon, 38·6° C.; 6 p.m., 37·4° C.; 8 p.m., when 38·1° C., fourth sublimate injection.

June 30.—2 a.m., 38·8° C.; 8 a.m., 36·8° C.; 10 a.m., when 37·2° C., fifth and last sublimate injection; 6 p.m., 38·8° C; 8 p.m., 36·8° C..

July 1.—6 a.m., 37·6° C.; 8 a.m., 37·2° C.; 12 noon, 38·6° C.; 6 p.m., 36·8° C.

July 2.—6 a.m., 36·2° C.; 6 p.m., 37·2° C.; 10 p.m., 37·5° C., and so on, the highest morning temperature being 36·4° C., and the highest evening 37·5° C.

Besides frequent packings and drugs on June 19 and 23, patient was twice daily given an injection all at one time of 0·5 grm. dihydrochlorate of quinine (Merck), and from June 23 one esanophele pill thrice daily instead of quinine. The temperature also fell suddenly after aspirin; 0·5 grm. veronal *per os* was given a few times, and digalen injections *per os*.

Patient recovered, and was discharged on July 19.

Patient's recovery from the confinement was normal, except that the catheter had to be passed up to July 10. The fever, therefore, could not be due to the confinement, and was indeed present three weeks before labour commenced; its genesis is of the greatest interest. Although isolated tropical parasites were found in the blood at D., as well as in hospital later, the character of the fever and therapeutic ineffectualness of quinine practically ruled out the possibility of tropical malaria being the sole cause, especially as "quinine fever" could not be admitted.

The progress of the disease and type of fever were far more indicative of a septic process. No certain support for this assumption could be obtained, however, despite repeated exhaustive researches. The cerebrospinal fluid was not examined, but no symptoms pointed to cerebrospinal disease such as the patient was supposed to have had in her youth. Even Staff-Surgeon M., who was called in at the request of the patient's husband, could find no cause for the fever, and could only fall in with the supposition of latent sepsis. We therefore decided to try intravenous sublimate injections, recommended by Baccelli, of Rome, for "acute infections with doubtful diagnosis and latent infection carriers." The formula adopted in his clinic was used:—

Hydrarg. bichloride	...	0·01 = $\frac{3}{4}$ gr.
Sod. chloride	... ...	0·075 = 1$\frac{1}{8}$,,
Aq. sterilisat.	... ...	10·0 = 2$\frac{1}{2}$ dr.

Instead of repeating the dose up to three times in twenty-four hours, as Baccelli does, the patient was given two injections daily, five altogether being given in three days. An undesirable secondary effect observed was profuse intestinal activity for a week—seventy-three "sublimate stools" within seven days.

The result was surprising, as is evidenced from the fall of temperature, which at once set in (see above). The effect of the "therapy of despair," as it were, was specially noticeable in the almost immediate resuscitation of the patient, whose life was almost despaired of.

Abstracts.

THE ETIOLOGY OF BERIBERI.*

By W. J. J. Arnold, B.A., M.B., D.P.H.

St. Helena.

In view of the widespread tendency to accept as proved that beriberi is due to the eating of decorticated rice, it behoves those whose experience contradicts this theory to express their opinions. Dr. MacGilchrist, writing from Bengal, has quite recently given an instance of its occurrence on board ship where diet was not at fault, but everything pointed, in his opinion, to an infectious origin. Dr. Stanley, writing of fifteen years' experience of Shanghai and other places, is convinced that beriberi is infectious, and probably conveyed by parasites.

The epidemic which occurred on this island in 1901 amongst the Boer prisoners of war was certainly not attributable to diet. Rice formed no part of the diet, which was in every particular a liberal one. Prior to the appearance of the disease there had been much overcrowding in the Boer encampment. Groups of the prisoners, linked by ties of kindred or friendship, had built for themselves small huts made from old biscuit tins, the floors and bunks being of wood. Into these they packed themselves like sardines in a box. The Boers were the reverse of cleanly. Here, therefore, were two factors usually associated with outbreaks of beriberi. The disease is not unknown in South Africa, and was probably imported with the prisoners of war.

I have long been impressed with the probably infectious nature of the disease. In such a case as the following it is difficult to avoid this conclusion.

In July, 1903, an American whaling brig, 411 tons burthen, put into Jamestown for medical aid. The captain reported that seven men had died of some illness during the past three weeks, and that many of the men on board were apparently suffering from the same disease. He did not know what it was, but thought it must be beriberi from what he had heard of it in other ships. The deaths of the men had taken place suddenly while they were at work on deck.

On examining the ship's company I found eleven men in varying stages of beriberi. Several were in a serious condition, and one man was in the last phase of heart failure. He died the following day in hospital.

This vessel had a crew of thirty all told. Nineteen men slept in the small forecastle, ventilated only by the companion way, and lighted by a small glass oblong let into the deck. The cubic space available for these nineteen men involved gross overcrowding, and there was a lack of even average cleanliness. I did not find that the diet varied substantially from that found on board most sailing vessels. No doubt salt beef and pork as the staple article of diet is not ideal, but fresh bread was served every day, and preserved vegetables and lime-juice were issued at regular intervals. Rice was not eaten. A monotonous fare made up largely of preserved provisions may be looked upon as a predisposing cause of ill-health, but there are no grounds for going further in the present instance.

After the removal of those seriously ill to hospital, measures were taken thoroughly to disinfect and cleanse the quarters of officers and men, together with all bedding and clothing, &c. Fumigation with SO_2 and the liberal application of 1 in 1,000 mercury perchloride solution was carried out on three or four separate occasions, the men meantime sleeping on deck. After remaining in port for three weeks this vessel, taking those of the crew who had recovered and some fresh hands, put to sea, and did not touch land till she returned to St. Helena at the end of six months. The crew had kept in perfect health, and no fresh cases of beriberi had appeared.

Since 1903 every ship calling at St. Helena with beriberi cases on board has been subjected to very thorough disinfection and fumigation of the quarters of the sick. In endeavouring to trace the connection of any case on board ship with previous cases of beriberi, I have never failed to find one at least of three circumstances: (*a*) The existence of beriberi on the ship on a previous voyage; (*b*) the presence on board of a member or members of the crew who had previously had beriberi; or (*c*) some member of the crew who had recently sailed on a ship where beriberi prevailed though he had not then had the disease himself.

There is a great deal that points to the conveyance of the disease by parasites. The bug is more likely than lice to harbour the possible germ. The bug clings more to places—the chinks and crevices of floors and bunks, &c., and its eggs are difficult to destroy. The organism may even develop in the latter, as in the case of the *Spiroshaudinnia duttoni* in the ova of the tick. Before the etiology of beriberi can be finally settled, the part, if any, played by parasites must be thoroughly investigated by modern methods.

*Abstract of paper in *British Medical Journal*, February 7, 1914.

WILD GAME AS A RESERVOIR FOR HUMAN TRYPANOSOMES.*

An Analysis of the Available Evidence from the Northern Shores of Lake Victoria Nyanza.

By H. Lyndhurst Duke, M.D., D.T.M. & H.Camb.

The question whether the wild game of the sleeping sickness areas of Africa are acting as reservoirs for the human trypanosomes, *Trypanosoma rhodesiense* and *T. gambiense*, has recently attained great importance. As is well known,

* Abstracted from paper in the *British Medical Journal*, February 7, 1914.

a terrible epidemic of sleeping sickness devastated this part of the Uganda Protectorate in the years 1899-1909. The disease was presumably introduced by caravan porters from the Congo, where trypanosomiasis has long been known to the natives. In 1908-9 the native population of the lake shore of the mainland and of the neighbouring islands was removed inland, away from the fly. Since this measure the disease has practically died out in this part of the Protectorate. In spite, however, of the removal of the natives from contact with the wild lake shore *Glossina palpalis*, a certain proportion of these flies are still (1912) capable of infecting monkeys with a trypanosome. The morphology and general behaviour of this organism are indistinguishable from those of *T. gambiense*.

Again, in September, 1911, an exactly similar trypanosome was obtained from the blood of two situtunga antelope shot on Damba Island, about nine miles from the mainland. The point to be decided is: Are these "wild fly" and "situtunga" trypanosomes descendants of the *T. gambiense* which caused the recent epidemic, or are they merely parasites of the antelope, and not capable of surviving in a human host?

For convenience, the trypanosome obtained from Damba situtunga will be referred to as the "Damba trypanosome." The organism pathogenic to monkeys and derived from wild flies will be called the "wild fly trypanosome."

(*a*) There is no reason to doubt the identity of the "Damba" trypanosome and the "wild fly" trypanosome.

(*b*) There is evidence that the trypanosome of the fly on the mainland and island coasts of Northern Lake Victoria Nyanza is derived from antelope, rather than from hippos, reptiles, or birds.

(*c*) There is evidence that the trypanosome of the fly is not derived from truant natives.

(*d*) There is no good evidence to show that the Damba and fly trypanosome is not identical with *T. gambiense*, but that there is a certain amount of evidence to show that it is identical.

The morphology and animal reaction of these trypanosomes correspond closely with what is known of *T. gambiense*. They cause a more or less chronic disease in monkeys and rats, and are unaffected by human serum.

The data relating to the animal reactions of the human strain of trypanosome obtained from Uganda natives by the Royal Society's Commission at Entebbe show that the disease at the first inoculation was slightly more chronic. Thus white rats lived for three or four months, paralysis of the hind quarters being observed before death in some, but not all, experiments. In four uncomplicated monkey experiments, in which the animals were inoculated directly from human beings, the average duration of the disease was 184 days—the maximum being 250 days, the minimum 107 days. In four monkey experiments with the Damba trypanosome the corresponding figures were 172, 207, and 144 days.

Four monkeys experimentally infected with the "wild fly" strain (1910-11) lived for an average of 114 days (maximum 147 days, minimum 85 days; this last monkey was an old emaciated animal at the commencement of the experiment, and cannot therefore be looked upon as a fair test of the pathogenicity of the trypanosome). A single monkey experimentally infected with wild fly trypanosomes at Entebbe, in 1904, lived 214 days.

A white rat subinoculated from a rat infected with human blood by the Entebbe Commission died in two months and a half without any paretic symptoms. The average duration of the disease in six white rats inoculated with the "Damba trypanosome" was 61 days (maximum 74 days, minimum 44—a very young animal). Similar figures were obtained with rats inoculated with the "wild fly" strain. It should be noted that the trypanosomes in these Mpumu rats had in each case undergone previous passage through monkeys. Some of the rats showed paralysis of the hind quarters before death, others did not.

It will thus be seen that the general behaviour of the Damba and "wild fly" trypanosomes in monkeys and rats resembles that of the *T. gambiense* obtained in 1903 directly from infected natives. Guinea-pigs were more refractory to the human than to the two recent lake shore strains. It must be remembered, however, in this connection that when originally tested by Bruce and his collaborators *T. pecorum* was non-inoculable into these animals, though it subsequently proved pathogenic. If such a modification can occur in a trypanosome in the course of a few months at the laboratory, much stress cannot be laid on this difference. For if the human trypanosome were excluded from the blood of man for several years, it might be expected to show a change in its behaviour towards other hosts.

(*e*) Wild antelope of the species frequenting the lake shore are inoculable with the human trypanosome, and the parasite persists for any length of time in their blood, or is rapidly fatal.

Given a number of fly and antelope in a district, there is nothing to prevent the infection with *T. gambiense* being kept up indefinitely.

(*f*) The evidence available on the subject of the infectivity of the wild fly to the "wild fly" trypanosome is such as would lead to the conclusion that this trypanosome is an antelope parasite, a descendant of the *T. gambiense* which caused the recent epidemic.

(*g*) There is in Uganda no species of trypanosome, other than *T. gambiense*, with which the "Damba" and "wild fly" trypanosome can be identified.

(*h*) There is no evidence that a mammalian trypanosome could persist in wild flies for years without some mammalian intermediary.

(*i*) In the prohibited lake shore area the proportion of island antelope which is infected with *T. vivax* or *T. uniforme* is 14·2 per cent., and of mainland antelope 10 per cent.

SLEEPING SICKNESS, TSETSE, AND BIG GAME.*

By GEORGE PRENTICE, L.R.C.P. & S., D.T.M.
Nyasaland.

THOSE on the spot attribute the enormous increase of tsetse-fly during recent years entirely to the great increase of big game. The increase of game we attribute entirely to the protective measures employed by the governments. The laws were passed with a view to protecting the wild fauna of this part of Africa, and they have succeeded beyond the wildest dreams of those who were responsible for bringing them into being. The wild animals have been preserved, but domestic animals have been sacrificed, and now we are paying a heavy penalty in human lives for having interfered with the balance of Nature.

In a district in which the natives owned 200 head of cattle an incursion of tsetse took place following upon the herds of buffalo that came into it. Within two years the natives owned only eighty head. Under normal circumstances there should have been an increase of 50 per cent. per annum—300 head in all, instead of eighty.

In another district where the people were rich in sheep, goats, and cattle, a recent investigation revealed the presence of only four dogs, and these recently imported. Besides having lost their stock, the people are now being killed off by *Glossina morsitans*. Yet with all this going on the people are not allowed to act in self-defence. Game laws which would turn any Government out of power if imposed at home are forced upon a primitive people here who have no means of redress.

To those of us who take an interest in politics, it is not a little amusing to find the Chancellor of the Exchequer posing in the matter of game as the friend of the down-trodden peasant at home; whereas a member of the same Government, in the person of the Colonial Secretary, carefully protects the huge animals that eat up the native's crops, kill off his cattle, and carry in their blood the disease germs of certain death to human beings, and that notwithstanding a promise we believe he made to a deputation representing all the missionary societies at work here—that on evidence being adduced that game was responsible he would not fail to act. His replies to Dr. Chapple in the House of Commons have already been referred to in the Journal. Not only do elephants destroy the mealie crops, they this year (1913) fought the owners for possession of the gardens. In my hospital at Kasungu I had recently four patients at one time who had been mauled by wild animals. Three of them had been hurt by elephants in the gardens.

There is one aspect of this question to which I have sought to draw attention. The infant mortality in this country is appalling; so, too, is the mortality among adults from diseases of the alimentary tract. The native has no sick-room cookery worthy of the name. We have sought to teach him the value of milk as a diet for infants and during disease. But along comes tsetse, and this potential food supply in sickness is cut off. Thus indirectly by destroying the food supply and directly by carrying the deadly trypanosome does tsetse kill off the population. When we speak of the population being killed off we mean what we say. The disease, both in Rhodesia and Nyasaland, is much more serious than certain reports make it out to be. The first cases I had in my hospital here were from a district where sleeping sickness was not known to exist. Reports reached me of a very fatal disease having broken out among the natives, who spoke of it as a virulent form of measles. A lad in our employment entered the district and got badly bitten by tsetse. He became very ill, and was carried back to my hospital. I thought he had tick fever, and proceeded to examine his blood for spirochætes; I found trypanosomes. So far as my knowledge goes, that was the first case for which *G. morsitans* was held responsible by a medical man. The Government sent a medical officer into the district and other cases were found. The virulent form of "measles" had carried off many victims before the real nature of the disease was diagnosed. It has carried off many more since.

We believe that the disease should never have existed here, and that it can be, and ought to be, eradicated. We believe that for the time being a severe onslaught must be made upon the wild animals until these are driven back from human settlements and from the public highways. Until the present danger is past, all wild animals capable of acting as a reservoir of trypanosomes should be treated as vermin and destroyed or driven out just as rats are destroyed during an outbreak of plague. I, for one, would welcome an outbreak of rinderpest such as swept this country in 1893 and 1894. It would leave us with a clean country, and, having learnt our lesson in a hard school, we should be slow to impose laws protecting game. We cannot cure the disease when once it has taken hold of human beings. Only those who have seen the victims can realize the horror and the hopelessness of it. We can starve out tsetse by depriving it of its supply of warm blood, and at the same time we can remove the natural reservoir of the disease by driving out or destroying the game. It has been asserted that tsetse can and does exist where it cannot possibly depend upon game for its sustenance, game being absent. This does not hold good of *G. morsitans* in Nyasaland and Rhodesia. Instances cited by the Colonial Secretary do not stand the test of investigation.

Again, we are told that if game is driven out tsetse may attack man and his domestic animals more vigorously than at present. In that case, when rinderpest killed off the game tsetse ought to have betaken itself to the nearest villages to feed upon the people. But it did not. It disappeared or remained only in small patches among the foothills, where small herds of game escaped the rinderpest. Similarly, in South Africa, when the Boers

* Abstracted from paper in the *British Medical Journal*, February 7, 1914.

shot off the wild animals tsetse ought to have remained behind to feed upon man and his domestic stock. But it did not. There is ample proof that wherever game is killed off by disease, or hunted out, *G. morsitans* disappears. There is no proof to the contrary. I hold that the time for experimenting has passed, and that we ought at once to adopt such measures as may be necessary to save the people here from further risk and loss. Traders, farmers, planters, transport riders, and missionaries ask for permission to act in self-defence, permission to save their interests from ruin and themselves and their people from danger. If we make a mistake we suffer for it, and can blame no one but ourselves. But why should we be called upon to suffer for the fads and mistakes of people at home? We hold that further temporizing, in the light of our present knowledge, is nothing short of criminal folly.

With reference to Dr. Neave's suggestion that the game within a certain area should be impounded and destroyed, I may say that this suggestion was made fully two years ago. We asked, when the first epidemic broke out in Nyasaland, to have the game destroyed. This was refused, on the grounds, among other reasons, that the outbreak was distinctly localized, and that any interference with the game might cause the animals to spread out and carry disease into clean districts. On the strength of this statement I suggested to the Acting Governor that he should impound all the animals within the area mentioned, and once and for all stamp out the disease by exterminating the animals. To this proposal I got a reply that while His Excellency appreciated my good intentions he did not regard the proposal as practicable.

In conclusion, I should like to express my appreciation of and gratitude for the work of the Liverpool Commission, which has settled once and for all many hitherto hotly disputed points, and also my gratitude to the *British Medical Journal* for the publicity it is giving to the work of Dr. Warrington Yorke.

IMMUNITY OF CERTAIN TRACTS FROM PLAGUE.

The Bombay Bacteriological Report for 1913.

By Major Glen Liston, C.I.E., M.D., I.M.S.

Captains Kunhardt and Taylor worked in Madras while Captains Gloster and White undertook the observations in the United Provinces.

In India large centres of the wheat trade in particular have suffered severely from plague. In Madras there is a comparatively small trade in wheat; there is, however, a considerable trade in rice. It may be that infection is more readily conveyed in wheat than in rice.

In Bánda, a town situated in the Bundelkhand division of the United Provinces, a division of these provinces which has suffered very lightly from plague, the average number of fleas found upon rats for many months in the year was larger than the number found on rats in any other part of India. Though the climate is eminently suitable to plague, harbouring in the houses a very large rat population as susceptible to plague as Madras rats are, Bánda town has entirely escaped plague though the disease occurs year after year with considerable virulence in the comparatively adjacent town of Cawnpore, which is distant from Bánda, in a direct line, only some seventy miles. The facts are:—

(1) Very little grain is imported into Bánda while considerable quantities are exported from the place. This grain is often stored in pits where rats and even insects cannot survive owing to the development of carbon dioxide gas which accumulates in the pits. The gas is produced by the living grain which consumes oxygen and gives off carbon dioxide gas.

(2) The people of the Bundelkhand are more closely associated with the peoples of Central India, where epidemics of plague only occasionally occur, than with the people living in the badly plague-infected Ganges Valley. Nevertheless, Bánda is situated on a railway line which connects it with the plague-infected districts of Cawnpore and Allahabad, and many of the merchants in Bánda pay frequent visits to both these towns, especially the former, for the purpose of transacting business. Also during a severe outbreak of plague in a district to the south of Bánda many refugees found shelter in Bánda.

The facts so far collected indicate that the places which have escaped plague infection during the seventeen years this disease has been present in India owe their freedom from infection, not because the prevailing conditions are such that plague could not become established in them, but rather to a combination of circumstances which are unfavourable for the importation of infection into them. These circumstances may be either (1) a very small import trade in grain, (2) remoteness from important trade centres, or (3) climatic conditions which are unsuited for the prolonged existence of the rat-flea when separated from the natural host.

The import trade in grain can be controlled to assist in making a tract less vulnerable to plague. The investigations have shown that the grain trade may be largely responsible for the spread of plague in India; it is important therefore that some action should be taken to regulate this trade so that it will no longer be a source of danger to the community.

Captain White, I.M.S., from a study he has made of the trade returns of the United Provinces, strongly supports the view that towns intimately associated with the collection and distribution of grain run not only great risk of becoming infected with plague, but when infected are important centres from which infection is disseminated to distant places by means of trade. His observations, in fact, have brought into prominence the urgent necessity for taking measures to protect grain from contact with infected rats. This is a line of action which up to the present has been little followed by the authorities who are responsible for the preven-

tion of the spread of plague. The proper storage of grain, so that it does not become infested with rats, is a measure which should be the more easily carried out because it is well known that rats consume and destroy considerable quantities of grain; the cost of excluding these animals from grain stores for this reason would to some extent be met by a decrease in the loss of grain during storage. But the greatest advantage which would accrue from the enforcement of this measure would be the lessened opportunity for the transport of plague infection.

The majority of the owners of buildings in which large quantities of grain is stored are wealthy men who can well afford to keep them in better repair. The presence of ramshackle rat-ridden grain stores, situated often in the midst of the most densely populated parts of towns and in the neighbourhood of which large weekly markets are held, attracting buyers from the surrounding towns and villages, is a serious menace to the public health. The presence of such buildings in the most populous parts of towns should be regarded as a public nuisance.

RECENT RESEARCH RELATING TO UNDULANT OR MEDITERRANEAN FEVER.*

By Fleet-Surgeon P. W. Bassett-Smith, M.R.C.P., C.B., R.N.

Since the Commission of the Royal Society reported on the etiology of this disease in 1906, the International Congress of Medicine, in 1913, discussed the nomenclature question and agreed that the term *Undulant fever* was the most satisfactory. It does not limit the distribution of the disease, it draws attention to one of the most frequent clinical signs, is euphonious, and is easily applicable to any language.

The fever occurs on the islands and shores of the Mediterranean as well as in the interior of Spain, France, Italy, Greece, the Levant, Egypt, Tripoli, Tunis, Algeria, and is present in most of the islands, Sicily, Cyprus, Candia, Sardinia, Corsica, &c. It is not only casual inhabitants that are affected in these places, as believed by Shaw, but it is endemically present in most of them. During the past few years the extension of the disease into districts far from the sea has been shown to exist. In Spain by de Cottes, Durán, Ramon y Cajal, and Suarez. In France by Cantaloube and Wurtz. In Italy by Sangiorgi and Golini. In Portugal by Bettincourt. This extension inland is a most important epidemiological factor, and is in agreement with the findings of the Commission and the view long held by Zammit that inland villages may be as heavily infected as those near the sea.

In the East it is endemic in Northern India, in the Punjab. There is no doubt that cases occur in China which are probably of endemic origin, but very little real scientific work has been carried out there, at least that I know of, to prove the means of infection, for milk as an article of diet is but little used except at Hong Kong and Shanghai, where the dairies are well supervised. Most of the cases have been reported from the Yangtse region. In the Philippines many cases have been recognized, and the disease conveyed by the sick soldiers to the United States of America.

In Africa cases have been reported from the Sudan, Blue Nile, Lake Chad, and Uganda. During and after the Boer War the disease became very prevalent in South Africa, the Transvaal, and Orange Free State, that is, when the cattle were few and more goats' milk was used. German South-west Africa is now included in this large endemic region.

In America there appears to be a true endemic centre in Texas, of considerable antiquity, extending into New Mexico. There is probably also a small centre of infection in Peru.

Wherever the disease is found, goats are practically always present, and distribute the disease in Italy, India, South Africa, and America.

Besides goats, other ruminants may carry the disease, and the products of milk are often infective. The view that other methods of infection are frequent is steadily gaining ground, and may be summed up in the words that in urban areas the infection is generally through ingestion of the infected milk, but in rural districts the disease is commonly spread by direct infection or inoculation of infected soil or milk. In Corsica it is disseminated by a few infected goats to others when they pasture in the hills; these goats infect the dogs and goat-men with them. And when the goats are brought down to the towns at certain seasons they are milked mostly by women; these women become infected through the hands by the organisms in the milk, and the greater part of the milk is converted into cheese which is eaten fresh, and in which the micro-organism will retain its vitality for fourteen days.

An epidemic near Rome showed how one infected goat gradually spread the disease in the local herds, how after a year cases occurred among those people associated with the most infected herd, and spread quickly amongst them when once started. These people, who lived under bad hygienic conditions, did not consume the milk, but acquired the disease by inoculations or direct contact with the sick.

A further point is the danger caused by ambulant human cases; these may be passing out the micro-organism in the urine, infecting the soil and out-houses, and conveying the disease to those employed in these places.

As in typhoid, one must look to the three F's, food, fingers, and flies, as possible carriers of the organism. Children at the breast are rarely infected directly; but infants do sometimes show signs and give positive serum reactions, as shown by Longo at Catania, and Lunia, of Palermo; in fact, the latter thinks that cases are more common than are reported through not being recognized. As the *Micrococcus melitensis* has been shown to be present in the milk of infected mothers this is probable.

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* Abstract of paper read at Society of Tropical Medicine and Hygiene, February 20, 1914.

At Kléber, in Algeria, a small but interesting human epidemic occurred. In one family four out of five were attacked; these had no goats, and drank only boiled milk from an uninfected source. All the members, including the goatherd, of the family which had lived in the house previously had suffered from the fever. The infection was believed to be purely local, due to contamination of the house and sheds before the owners took possession.

In descriptions of the infecting micro-organism there is again much discrepancy. Hiss and Zinsser go so far as to call it the *Bacillus melitensis*, others call it a cocco-bacillus, some say it is motile and describe flagella as being present. From a very large number of examinations I believe the organism to be a true coccus, often under cultural conditions seen as diplococci, due to the division of the coccus. In old cultures bacillary forms are common; these are involution forms and favoured by different media. Where growth is vigorous, long chains tend to be present, made up of diplococci; this streptococcic character is like that which occurs in the culture of the pneumococcus. The *Micrococcus melitensis* is able to produce a toxin which acts as a hæmolysin.

Pathogenicity.—Monkeys and goats, horses, dogs, rabbits, guinea-pigs, rats and mice can be experimentally infected. Rabbits, after subcutaneous inoculations with living cultures of the *M. melitensis*, will give a serum having a high agglutinating power, but a true septicæmia does not appear to be produced, as the organism cannot be recovered from the circulating blood; these animals were found by Eyre to die in about six months. Two animals I have used for this purpose reacted up to 1 in 2,000, but have gradually lost these agglutinating reactions and have made complete recoveries. Guinea-pigs are not generally affected, unless the pathogenic power of the organism is raised and the injections given intra-cerebrally. In rats and mice antibodies are formed in small amounts or not at all.

The infection may be naturally acquired by man, goats, cows, sheep, horses, mules, and dogs.

In 1912, Négre and Raynaud [1], while testing various strains of the micrococcus in Algiers, found one that, though it gave the morphological and cultural characters of the type, yet it was able to agglutinate only with very low dilutions of serum, rich in antibodies for the type. On working this out it was found that animals injected with this strain produce a serum rich in antibodies for itself, but which only agglutinated other strains in low dilutions. It is also possible to remove the antibodies from one without affecting the other, as shown by absorption tests. This variety, which had been suspected by Zammit, is therefore distinct from the type in its serum reactions, and is described by Négre and Raynaud as *M. paramelitensis*. The strain had previously been known as *M. melitensis* Br. It is a curious fact that this strain had been originally isolated by Bruce, and had been kept, without its peculiar characters being recognized, in the laboratories of Algiers and Tunis, from which places subcultures had been widely distributed to other laboratories in Europe—thus probably causing many of the errors in diagnosis which have been so frequently reported.

In 1913, I was able to report a very prolonged case of fever in a lady, contracted at Hyères, in which, though the symptoms were those of undulant fever, no positive reactions could be obtained. The serum was tested in many laboratories, and by different experts; when the blood was tested with the paramelitensis strain it reacted up to 1 in 400. Human infections therefore exist, as well as animal.

In the routine examination of goats in Algeria, out of 490 tested, in only twenty were positive lacto-reactions obtained; nine of these were with the *M. melitensis*, nine with *M. paramelitensis*, and two with both; most of the infected goats had been received from Spain. The frequency of the infection of goats by the paramelitensis strain is of great importance.

Diagnosis.—The methods for animals and humans must be separately considered. In diseased animals there is a general infection of the blood, spleen, liver, kidneys, as well as in the lymphatic system especially affecting the deep glands. The specific micro-organism passes out of the body in the urine, fæces, and milk. From the urine and milk more or less pure cultures can be frequently obtained, thus giving definite evidence of the disease. The lacto-reaction as introduced by Zammit and Horrocks is the most ready and generally used method for detecting the infected goats, and this could always be controlled by serum reactions or other more certain methods.

Recent work tends to show that in many of the infected goats there is a localization of the organism producing a mammitis without general septicæmia.

Some experiments carried out by Vallet and Rimbaud [2] found that with healthy guinea-pigs reactions were not obtained in higher dilutions than 1 in 20; in rabbits it rose to 1 in 50, and in twenty-one healthy dogs eighteen reacted in dilutions varying from 1 in 20 to 1 in 400. Heating the serum always prevented these reactions.

Martel, Tanon and Chrétien [3] state that heating the serum does not always prevent chances of error, and that it is indispensable to carry the serum agglutination test for goats up to 1 in 100. Also that reactions with milk are too variable to be used for diagnosis.

The author carried out a series of experiments which confirm Kennedy's [4] results. To avoid errors in testing cows' milk, which in some cases appears to have a natural tendency to agglutinate the *M. melitensis*, the heated milk should be very thoroughly centrifugalized, a dilution of not less than 1 in 20 should be employed, using distilled water instead of saline solution, and for preference the microscopic method with a one-hour limit, rather than sedimentation.

Kennedy found that these agglutinins were also obtained with the milk whey, but were held back by filtration.

The apparent widespread occurrence of cows' milk in London agglutinating the *M. melitensis*, and the

absence of any evidence of endemic undulant fever there, in itself is strong evidence against a true infection of the cows.

In man diagnosis is made with most certainty by cultivating the organism from the blood; this is generally successful in early cases with well-marked fever, when an advanced cachectic condition is present this procedure will often fail. From 1 to 5 c.c. should be drawn off and distributed into two flasks of nutrient broth from which subcultures into agar can usually be obtained about the third day. The agglutination reaction with the serum is the most common diagnostic method, either observed microscopically or by means of sedimentation tubes. Using unheated serum, Carrieu and Anglada found that with certain strains of *M. melitensis* non-specific reactions may occur in dilutions from 1 in 10 to 1 in 200, but with specific sera these variations with different strains were very slight; they therefore recommend that for diagnosis a serum should be tested with many strains before a conclusive opinion can be formed. This is not the author's view. Given a good strain of known agglutinable power, and using all precautions, errors will be very few with a 48-hour agar growth. From this a strong emulsion is made, allow any auto-clumps to settle, and pipette off part for use. Have two tubes of serum, one heated to 57° C. for half an hour and one unheated; test each in dilutions of 1 in 40, 1 in 100, 1 in 400 microscopically and by the sedimentation method. The latter tubes are left in the hot incubator for two hours and then read off; they are then set aside in the cold for twelve hours and a final reading taken. For controls a known specific serum and a normal blood should always be used.

Out of sixty-five control sera used by myself, tested with five strains of *M. melitensis*, in only one was there a positive reaction. In a series of 150 sera from patients in Haslar Hospital, in 1907, suffering from all kinds of diseases, four gave positive reactions; in these four a careful history showed that they had been under treatment at Malta Hospital or had previously suffered from the fever.

Ronchèse states that Widal, in his laboratory, caused an emulsion killed with formalin (2 drops to 5 c.c.) to be used; this was safer and acted quite satisfactorily, keeping well for over a year. Thirty sera of cases suffering from febrile conditions, other than undulant fever, were tested with this emulsion and all gave negative reactions.

When carrying out the reaction the following points should be remembered:—

(1) The culture to be used should be proved to be active with known specific sera and should not agglutinate with other sera. The use of a para-melitensis strain would fail to agglutinate in high dilutions with a true undulant fever serum and give rise to a negative error.

(2) As recommended by Négre and Raynaud, the heated and unheated serum should be tested, the former cutting out the non-specific agglutinations and preventing a positive error in non-undulant cases.

(3) The test should always be carried to high dilutions, up to 1 in 400, to avoid paradoxical reactions.

A second sero-diagnostic method which can be used is that of complement fixation. This has been employed extensively by Misseroli and others, and I have found it to give good reactions; it acts as a very efficient control to the agglutination test, but the value of different strains of *M. melitensis* as an antigen shows often great variations. Cases may sometimes fix the complement well and give unsatisfactory agglutinations.

Vigano has lately brought forward a precipitin test as a diagnostic procedure, but this is unlikely to act when the disease cannot be recognized by agglutination methods.

Clinical diagnosis is difficult owing to the irregular character of the symptoms, the long duration of the disease, and the presence of certain abortive forms. This is noted particularly in country districts of Spain, Italy, and Africa, where the disease is but little known. Cases are frequently diagnosed as typhoid, para-typhoid, septic and gastro-intestinal infections; among young children these errors in diagnosis are most common. Trotta [5] and others have shown that the micrococcus may occasionally act as a pyogenic organism causing suppurative arthritis and local abscesses. As in typhoid infections, node-like swellings on the sternum and ribs have long been known to occur in undulant fever, due to a tissue necrosis caused by the micrococcus. Chronic cases are easily mistaken for early conditions of infective arthritis deformans. In Texas and New Mexico the disease has been known as mountain or " slow fever " for at least twenty-five years, and is always found among people employed in goat rearing, the cases being most common after the kidding season during April, May, and June. In German West Africa the disease is now fairly common, but the cases are frequently diagnosed as malaria.

Treatment.—It is most important to remember that we have a very long and tedious disease to deal with; as this is not associated with ulceration of the bowel, it is therefore necessary to conserve the patient's strength as far as possible, and to give as much food as he can assimilate, being guided mostly by the condition of the tongue and the height of the fever. As cardiac irritability is a common condition, antipyretic drugs for reducing the fever are generally harmful and hydrotherapy is to be preferred. Insomnia is such a trying and common characteristic that it requires treatment; the patient should never be allowed to pass sleepless nights. Trional or other hypnotics should be given, or, if pain is severe, morphia may be used. Stimulants are not generally required in the early stages, but when cachexia is pronounced they often do great good. Preparations of yeast are useful, both to increase the number of the polynuclear white cells and hence assist in destroying the infecting micro-organism, and also to reduce the tendency to the development of the neuritis which is so common in the later stages of the disease.

Scordo [6], experimentally, has obtained very good

results by treating artificially infected goats with intravenous injections of perchloride of mercury, which gave rise to an increase in the corpuscular elements in the blood, raising the numbers of the red cells and the hæmoglobin, also producing a polynuclear leucocytis and sterilizing the blood, thus cutting short the fever; if this can be accomplished in man the method will be of great value. Some good results are stated to have been obtained in animals with "606," but these require confirmation, as rabbits may recover spontaneously if the infection is not very severe. In German South-west Africa intravenous injections of protargol as a germicide were used with success, but it is not free from danger, occasionally causing toxic nephritic symptoms and suppression of urine. Trambusti and Donzello, by inoculating goats with a nucleo-proteid derived from the *M. melitensis*, have prepared a serum which is stated to have given satisfactory results when used early, but other serums have always failed. Vaccines may be used with good results, particularly in subacute cases, both for melitensis and paramelitensis infections. The general improvement as shown by an increased feeling of comfort and a steady gain in weight is often very marked in these cases, and the opsonic index is seen to rise at the same time. This method, therefore, holds out considerable hope in protracted cases. It is possible that a polyvalent vaccine made from many strains of the micrococcus might give better results. The use of sensitized vaccines also requires trial.

For prophylaxis it is now generally recognized in endemic areas that the disease should be made notifiable, that local disinfectant methods should be carried out, that the importation of infected goats must be stopped, and that regular examinations of animals by competent persons must be periodically made. In France, Italy, and Northern Africa legislative action is strongly urged; this has been taken in France and Algeria with good results.

In conclusion, we should recognize that though the disease has been practically eradicated from the Naval and Military services, where protection of the food can be properly carried out, yet the disease is still rampant in very many endemic areas; also that the source of infection is by no means limited to ingestion of contaminated milk, but is frequently brought about by direct inoculation, particularly in rural districts, and that all cases, ambulant and otherwise, should be looked upon as potential carriers of the disease necessitating the thorough disinfection of excreta and contaminated articles.

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Review.

Beriberi. By Edward B. Vedder, A.M., M.D., Illustrated, pp. 427. John Bale, Sons and Danielsson, Ltd., Oxford House, Great Titchfield Street, London, W. Price 18s. net.

This book is by a particularly well-qualified author who was officially engaged for two years in examining and sifting the literature and facts relating to beriberi, besides having been long engaged in tropical work. It is one of the few books on the subject and deals with all information, recent and remote, bearing on the disease.

The extensive index, list of authors, and bibliography makes reference to all previous works particularly easy. The book is a distinct landmark in a most important study. It clearly enunciates the vitamine theory attributing the causation to a deficient diet and faulty metabolism.

The author maintains a judicious impartiality with regard to the infantile, ship and epidemic varieties, for although the disease is due to faulty metabolism, usually associated with deficient diet, this does not exclude the occasional origin from epidemic causes and even associated parasitic infections.

The book should be essentially useful to tropical workers and all dietetists in other parts of the world, for it is the one disease above all others which is capable of prevention.

The author fully discusses the distribution and prevalence of the disease, which may occur anywhere and at any time. The pathology is particularly useful for those wishing to refresh their knowledge. The chapter on symptomatology will perhaps be more useful to those whose experience of beriberi is limited and is more theoretical than practical.

The handy format of the book is not one of its least attractive features, and the well-chosen and well-reproduced illustrations render the book distinctly pleasant reading.

SEAMEN'S HOSPITAL SOCIETY.

The Annual Court of the Seamen's Hospital Society, to which are attached the London School of Tropical Medicine and the London School of Clinical Medicine, was held on Thursday, March 12, 1914. H.S.H. Prince Louis of Battenberg, President of the Society, took the chair. The Prince brought home to the large audience present the high claims the Seamen's Hospital had upon the people of the British Empire.

The other speakers were Lord Hugh Cecil, M.P., Vice-Admiral Sir Arthur M. Farquhar, K.C.B., C.V.O.; Mr. Perceval A. Nairne, Chairman of Committee; Mr. William Turner, F.R.C.S.,; and Mr. C. F. Leach.

Original Communications.

THE METEOROLOGY OF MALARIA.

By MATHEW D. O'CONNELL, M.D.

IN the minds of Englishmen, the Island of Walcheren, in the Netherlands, will ever be associated with the grave outbreak of malarial fever in the British Force which was despatched there in the autumn of the year 1809. The Force consisted of a fleet under Sir Richard Strachan and an army of 40,000 men under Chatham. Chatham landed at Vlissingen (Flushing) on August 15, and occupied Walcheren, South Beveland, and Schouwen. Of the troops landed on fever-stricken Walcheren, 7,000 died and 15,000 were disabled between the date of landing and December 23.

Flushing, like the whole Island of Walcheren, was very unhealthy until the second half of the nineteenth century. Better canalization of the island has so far improved its hygienic state that the proverbial Zeeland fever, which very often killed, especially visitors, has disappeared. The milder form of malarial fever continues there, but is now confined to certain localities at certain seasons of the year. So even at the present day it is of interest to note the atmospheric conditions at Walcheren in order to see if they can have any effect in producing those milder forms of fever which still linger there.

The Director-General of the Meteorological Institute of the Netherlands at De Bilt has kindly furnished me with the meteorological conditions at Flushing for August 9 and 10, 1911, as far as he was able. The dry bulb temperatures of the air are given hourly for a continuous period of thirty-six hours. The velocity of the wind is also given hourly for the same period. Hourly readings of the wet bulb temperature were not available, and there is no registering hygrograph there, so only the term-readings at five fixed hours, viz., 7, 8, and 10 a.m. and 2 and 7 p.m., were procurable. From these I have roughly estimated the hourly wet bulb temperatures at Flushing for the same period of thirty-six hours in the following table. The actual wet bulb records I have marked with an asterisk.

Walcheren, Vlissingen, 1911	Hourly atmospheric conditions at Vlissingen (Flushing) in the Island of Walcheren, Netherlands				Atmospheric conditions which raised body temperature above normal in the Lancashire cotton sheds				Degree to which body temperature was raised by exposure in the cotton sheds of Lancashire		
	Temperature of air, F.		Drying power of air per 10 cub. ft.	Velocity of wind per second	Temperature of air, F.		Drying power of air per 10 cub. ft.	Movement of air per second	Body temperature in mouth, F.	Pulse	Respiration
	Dry	Wet	Grains	Metres	Dry	Wet	Grains	Miles			
August 9, 7 o'c. a.m.	72·7°	65·6°*	30·7	4·5	72·0°	65·0°	29·0		99·6°	Not given	
,, 8 ,,	73·2	66 0*	31·0	4·4	73·5	68·0	21·5		100·0	100	26
,, 9 ,,	75·3	67·7	34·4	3·7	75·5	70·5	24·5		99·4	132	22
,, 10 ,,	78·4	69·4*	41·4	4·1	78·5	73·5	25·0		99·6	116	22
,, 11 ,,	81·3	69·4	56·3	3·3	81·5	74·0	39·5		99·2	86	20
,, 12 o'c. noon	82·4	69·4	61·8	3·6	82·0	75·0	38·0		99·2	99	16
,, 1 o'c. p.m.	84·1	69·4	70·3	4·9	84·0	77·0	39·0		100·3	84	25
,, 2 ,,	84·2	69·4*	70·8	4·9	84·0	77·0	39·0		100·3	84	25
,, 3 ,,	85·6	69·6	77·2	5·0	85·5	78·0	44·0		100·1	82	22
,, 4 ,,	88·8	69·8	92·6	4·7	89·0	76·0	73·0		99·6	98	18
,, 5 ,,	90·5	70·0	101·0	4·7	90·0	75·0	82·0		99·8	94	24
,, 6 ,,	89·8	70·2	93·4	4·1	90·0	75·0	82·0		99·8	94	24
,, 7 ,,	84·5	70·5*	68·5	4·4	84·5	77·0	42·0		100·6	96	26
,, 8 ,,	80·4	70·2	49·2	4·9	80·5	73·0	38·5		99·6	92	20
,, 9 ,,	77·0	70·0	33·0	4·4	77·0	73·0	20·0		100·1	100	18
,, 10 ,,	75·9	69·7	30·5	4·2	76·0	72·0	20·0		99·4	88	20
,, 11 ,,	77·0	69·5	35·0	2·6	77·0	73·0	20·0		100·1	100	18
,, 12 o'c. midnight	73·7	69·2	20·0	2·8	73·5	68·0	24·5		100·0	90	22
August 10, 1 o'c. a.m.	72·6	69·0	17·0	2·6	72·0	65·0	29·0		99·6	Not given	
,, 2 ,,	72·3	68·8	15·5	2·3	72·0	65·0	29·0		99·6	,,	,,
,, 3 ,,	72·5	68·6	18·1	2·5 A	72·0	65·0	29·0		99·6	,,	,,
,, 4 ,,	71·6	68·3	13·0	2·8	72·0	65·0	29·0		99·6	,,	,,
,, 5 ,,	70·8	68·1	12·6	1·2	69·0	65·0	17·0		100·0	100	26
,, 6 ,,	73·0	67·9	22·4	0·2	73·5	68·0	24·5		100·0	90	22
,, 7 ,,	74·0	67·8*	27·8	3·1	74·0	70·0	19·0		100·0	98	22
,, 8 ,,	75·2	68·1*	32·4	3·1	75·0	69·5	26·6		100·2	110	18
,, 9 ,,	79·3	70·4	42·2	1·5	79·5	74·5	26·5		100·2	90	24
,, 10 ,,	80·6	72·7*	40·2	2·5	80·5	73 0	38·5		99·6	116	22
,, 11 ,,	84·3	72·1	60·6	2·5	84·5	77·0	42·0		100·4	120	24
,, 12 o'c. noon	79·6	71·6	39·2	4·2	79·5	74·5	26·5		100·2	90	24
,, 1 o'c. p.m.	78·8	71·0	38·0	5·2	78·5	73·5	20·5		99·6	116	22
,, 2 ,,	80·7	70·5	49·5	4·9	80·5	73·0	38·5		99·6	92	20
,, 3 ,,	81·6	69·6	57·2	4·1	81·5	74·0	39·5		99·2	86	20
,, 4 ,,	77·3	68·8	45·4	4·4	77·0	73·0	20·0		100·1	100	18
,, 5 ,,	74·8	67·9	31·4	4·4	75·0	69·5	26·6		100·2	110	18
,, 6 ,,	72·3	67·1	23·1	4·7	72·0	65·0	29·0		99·6	Not given	
,, 7 ,,	69·6	66·3*	14·2	5·2	69·0	65·0	17·0		100·0	100	26

No perceptible movement of the air

Conditions which cause pyrexia bracketed A in above table.

* Actual wet bulb observations at Flushing.

In line with the meteorological conditions at Flushing so obtained, I have given, for comparison, the nearest meteorological conditions which were found, by actual observation, to raise body temperature in the Lancashire cotton sheds, and I have added to both the drying power of the air to indicate the rate at which heat was being lost from the body by evaporation.

Comparing the atmospheric conditions at Flushing with those which were found to raise body temperature above normal in the Lancashire cotton sheds, as given in the table, it becomes clear that the conditions at Flushing from 11 p.m. on August 9 to 7 a.m. on August 10, 1911, were such as must cause pyrexia in many, for (*a*) the wet bulb temperatures of the air during this period at Flushing were higher than the wet bulb temperatures of the air which raised body temperature in the cotton sheds; (*b*) the difference between the dry and wet bulb temperatures of the air at Flushing during the same period was, at each hour, less than the difference between the dry and wet bulb temperatures of the air in the cotton sheds with which they are compared; and (*c*) the conditions which so raise body temperature at Flushing persisted for *seven hours continuously*, whilst those whose body temperature was raised in the cotton sheds were in no instance exposed to the atmospheric conditions which raised their body temperature for more than *four hours continuously*, and in many of the observations for considerably less. In one observation in the cotton sheds the body temperature of a weaver (female) was raised to 100° F. (37·8° C.), the pulse to 100, and the respirations to 26 in *forty minutes* by exposure to an atmosphere having a dry bulb temperature of 69° F. (20·5° C.) and a wet bulb temperature of 65° F. (18·3° C.).

Any pyrexia so caused by the *night* atmospheric conditions at Flushing must *gradually* subside during the *following day period* as the difference between the dry and wet bulb temperatures of the air increases from the early morning until the late afternoon at Flushing as elsewhere; or it may be *rapidly* reduced by producing sweating either by sudorifics or by covering the body with blankets. If similar or nearly similar atmospheric conditions recur on the following night the pyrexia so produced must recur also; that is, it is obviously *intermittent*.

In the above observations I have not referred to the rate of movement of the air which must, from its effect on loss of heat from the body by conduction and connection, modify any increase of body temperature so caused. During the period referred to at Flushing, viz., from 11 p.m. on August 9 to 7 a.m. on August 10, the velocity of the wind did not exceed 2·8 metres per second, and even fell as low as 0·2 metre per second at 6 a.m., whilst during the following day the velocity of the wind, which was only 1·5 metres per second at 9 a.m., reached 5·2 metres per second at 1 p.m. and at 7 p.m.

In the cotton sheds it is said that no movement of the air was perceptible, but it was stated in the evidence that the weavers frequently complained of draughts, and even at times surreptitiously closed the ventilators of the sheds to stop the draughts of which they complained, so there must have been at least some movement of the air in the cotton sheds.

From such considerations I conclude that the *night* atmospheric conditions at Walcheren in August, even at the present day, are such as afford a sufficient explanation of the mild intermittent fevers which still linger there. The more scientific canalization which has so improved the health of the island would considerably reduce the dampness, *i.e.*, increase the drying power of the air there, and this, by its effect in increasing loss of heat from the body by evaporation, affords an explanation of the disappearance of the graver form of the disease, such as the fatal Zeeland fever, if it is but a graver form of one disease, caused in the manner I have indicated.

BRIEF NOTE ON *TOXOPLASMA PYROGENES*, CASTELLANI, 1913.

By Professor Ludwig Plate.

Professor of Zoology in the University of Jena.

I have examined Dr. Castellani's preparations made from the spleen of a case of long-standing fever terminating fatally in Colombo. The preparations were stained by Giemsa, and the bodies to which he has called attention were quite evident. I am absolutely convinced that these bodies are not degenerated red cells, nor degenerated blood platelets, nor degenerated tissue of any kind. The free bodies are especially characteristic, most of them being pear-shaped, crescentic, or lanceolated; 2½ to



6 microns in maximum diameter and possessing a well-developed nucleus, either in the middle or at one pole, which may at times be vacuolated; none of the bodies contain any pigment. Occasionally these bodies are agglomerated together in large groups. In my opinion the bodies described by Dr. Castellani with the name of *Toxoplasma pyrogenes* are without any doubt of protozoal origin and differ from any other protozoal organism so far described in man; but no conclusion can as yet be come to as regards their being toxoplasmata or not; in fact, no conclusion can be arrived at as regards their exact zoological classification.

NOTE ON A NEW GEOGRAPHIC LOCALITY FOR *BALANTIDIOSIS COLI*.

By Major B. H. Dutcher.
Medical Corps, United States Army.

Having been unable to find in the literature to which I have had access any record of the occurrence of *Balantidiosis coli* in the West Indies, I desire to record a case from San Juan, Porto Rico.

The patient, a native Portoriqueño, aged 22, born in Barranquitas, P.R., entered hospital December 25, 1913, complaining of mild dysenteric symptoms and with a temperature of 101·5° F. The temperature rose to a maximum of 102·8° F. the same day, fell by crisis to 99·4° that night, reached normal on December 27, and did not rise above 98·8° F. thereafter.

He was given a tablespoonful of a saturated solution of magnesium sulphate every three hours, with a liberal and nourishing diet for some days, and either by reason of or in spite of this treatment the stools became macroscopically normal within the next ten days.

The day after his admission active *Balantidia coli* were found in the bloody mucus, and continued to be found in the stools until January 23, 1914, when they disappeared. The stools contained also ova of uncinaria (gen. et. sp.?) and *Trichuris trichiura*.

A differential count on January 5, 1914, showed:—

Lymphocytes ..	...	19 5 per cent.
Large mononuclears	...	6·5 ,,
Polymorphonuclears	...	34 ,,
Eosinophiles ...	...	40 ,,

A count made on February 6, 1914, showed almost identically the same percentages.

Up to the present time, March 4, 1914, he has been doing full duty, and has been having normal bowel movements. A dose of magnesium sulphate, however, will reveal the presence of numerous balantidia.

Presiding at the annual general meeting of the Bovril Company, held in London, February 10, 1914, Lord Erroll told the shareholders that Sir Ernest Shackleton had selected Bovril as the only concentrated beef food to be taken by him on the forthcoming Imperial Trans-Antarctic Expedition, and that, in writing to his agent on the subject, Sir Ernest had said: "I consider the question of concentrated beef supply is most important."

The Second Edition of Professor Carl Mense's well-known work on tropical diseases, "Der Handbuch der Tropenkrankheiten," published by Messrs. J. A. Barth, of Leipzig, has now been commenced, and the first part containing chapters upon Arachnoidea, Hexapoda, Hemiptera, Myriapoda, and Insekta, &c., is now to hand. Dealing as it does with insect carriers of disease, its importance is, of course, manifest. The material contained in the text is accurate and well up to date, whilst the diagrams are excellent and well executed. In addition to this the literature is treated very fully and should be very valuable to any one studying the subject.

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THE JOURNAL OF

Tropical Medicine and Hygiene

April 1, 1914.

THE DINNER TO SURGEON-GENERAL GORGAS.

On Monday, March 23, 1914, there assembled at the Savoy Hotel a representative collection of many of the most distinguished personages in the Church, in the Law, in Medicine, and in Science, to do honour to Surgeon-General W. C. Gorgas, M.B., Surgeon-General, Medical Department, United States Army.

Sir Thomas Barlow, Bart., K.C.V.O., F.R.S., President of the Royal College of Physicians of London, occupied the chair.

The reception previous to the dinner and the whole evening's entertainment were characterized by a heartiness and cordiality which is the exception rather than the rule at proceedings of this kind, and

the spirit which prevailed was in harmony with the occasion for which the company had gathered. The work which Surgeon-General Gorgas began and carried out in Panama has been the talk of the whole world for some years past, and the visit of Gorgas to England gave British folk the opportunity of showing how highly they held in estimation the giant work he had accomplished.

As might be expected, men interested in tropical medicine and hygiene were present in large numbers, but there were present others who, although not workers in that field of science, gathered together to pay their tribute to a great man.

His Grace the Archbishop of Canterbury, His Excellency the American Ambassador, Lord Chancellor Haldane, the Rt. Hon. Lord Bryce, O.M.; the Rt. Hon. Lord Moulton; the Directors-General of the Army and Navy Medical Departments; the President of the College of Surgeons, England; the President of the Royal Society of Medicine; Sir William Osler, Bart., Oxford; the Master of Downing, Cambridge; several Members of Parliament, and representatives of several medical societies took part in the proceedings, bearing testimony by their presence to the deep interest all professions took in doing honour to Surgeon-General Gorgas.

Along with the principal guest two of his colleagues in Panama were present, namely, Major Robert N. Noble, General Inspector Department of Sanitation; and Dr. Samuel T. Darling, Chief of Research Laboratory, both members of the Panama Canal Commission.

Amongst those present we observed: Dr. P. S. Abraham; Dr. T. D. Acland; Col. A. Alcock, I.M.S., F.R.S.; Dr. D. E. Anderson; Mr. C. A. Ballance, M.V.O., M.S.; Mr. Arthur E. Barker, F.R.C.S.; Sir James Barr; Dr. E. F. Bashford; Fleet-Surg. P. W. Bassett-Smith, C.B., R.N.; Mr. James Berry, F.R.C.S.; Sir Anthony A. Bowlby, C.M.G., F.R.C.S.; Mr. Stanley Boyd, F.R.C.S.; Sir John Rose Bradford, K.C.M.G., M.D., F.R.S.; Mr. Horace E. Broadbent; Sir John F. H. Broadbent, Bart., M.D.; Dr. J. Mitchell Bruce; Mr. W. Deane Butcher; Dr. E. Farquhar Buzzard; Dr. Guthrie Caley; Mr. A. W. C. Cameron, M.B.; Mr. James Cantlie, F.R.C.S.; Mr. A. J. Carter and three guests; Dr. A. K. Chalmers; Sir Francis H. Champneys, Bart., M.D.; Sir R. Havelock Charles, G.C.V.O., M.D.; Sir William Watson Cheyne, Bart., C.B., F.R.C.S., F.R.S.; Sir William S. Church, Bart., K.C.B., M.D.; Dr. S. Monckton Copeman, F.R.S.; Sir Anderson Critchett, Bart., C.V.O., F.R.C.S.; Major S. L. Cummins, M.D., R.A.M.C.; Dr. H. H. Dale; Dr. Samuel T. Darling; Mr. J. H. Dauber, M.B.; Mr. Robert Donald; Sir Dyce Duckworth, Bart., M.D.; Mr. Percy Dunn, F.R.C.S.; Sir Frederic Eve, F.R.C.S.; Dr. John Eyre; Sir David Ferrier, M.D., F.R.S.; Sir James Kingston Fowler, K.C.V.O., M.D.; Dr. H. Andrew Foy, D.P.H.; Surg.-Lieut.-Col. P. J. Freyer, M.S.; Dr. Archibald E. Garrod, F.R.S.; Dr. R. A. Gibbons; Sir James Goodhart, Bart., M.D.; Mr. John L. Griffith; Dr. W. S. A. Griffith; Surg.-Gen. Sir William Launcelotte Gubbins, K.C.B., M.V.O., M.B.; Dr. A. J. Hall; Dr. F. de Havilland Hall; Dr. W. H. Hamer; the Rt. Hon. Lewis Harcourt, M.P.; Dr. C. F. Harford; Mr. H. F. Heath; Dr. G. William Hill; Mr. Harvey Hilliard; Dr. W. Ainslie Hollis; Dr. William Hunter; Dr. T. B. Hyslop and his guest; Sir John Jackson, C.V.O., M.P.; Major S. P. James, I.M.S., M.B.; Surg.-Gen. Sir Alfred Keogh, K.C.B., M.D.; Col. W. G. King, C.I.E., I.M.S.; Mr. P. P. Laidlaw, B.C.; Sir Arbuthnot Lane, Bart., M.S.; Dr. Arthur Latham; Dr. H. A. Latimer; Mr. J. B. Lawford, F.R.C.S.; Dr. T. M. Legge; Mr. C. B. Lockwood, F.R.C.S.; Dr. G. C. Low; Mr. J. Y. W. MacAlister; Mr. Ramsay MacDonald, M.P.; Dr. Hector Mackenzie; Surg.-Gen. W. G. Macpherson, C.M.G., M.B.; Mr. G. H. Makins, C.B., F.R.C.S.; Mr. E. Alan Masters, B.Sc.; Major J. A. Masters, M.D.; Surg.-Gen. Arthur W. May, C.B., R.N.; Dr. S. G. Moore; Sir Shirley F. Murphy, F.R.C.S.; Sir George Newman, M.D.; Dr. Arthur Newsholme, C.B.; Dr. H. A. Alford Nicholls, C.M.G.; Major Robert E. Noble; Dr. E. S. Pasmore; Mr. Herbert S. Pendlebury, F.R.C.S.; Dr. George Pernet; Capt. A. E. Hayward Pinch, I.M.S., F.R.C.S.; Dr. G. Newton Pitt; Mr. H. G. Plimmer, F.R.S.; Sir James Porter, K.C.B., M.D.; Sir Richard Douglas Powell, Bart., K.C.V.O., M.D.; Mr. W. T. Prout, C.M.G.; Dr. Edwin Rayner; Sir James Reid, Bart., G.C.V.O., K.C.B., M.D.; Mr. L. Reyersbach; Lieut.-Col. O. L. Robinson, R.A.M.C.; Major Sir Ronald Ross, K.C.B., F.R.S.; Prof. William Russell, M.D.; Dr. Louis W. Sambon; Dr. H. Scurfield; Dr. Seymour J. Sharkey; Prof. W. J. R. Simpson, C.M.G., M.D.; Col. B. M. Skinner, M.V.O., A.M.S.; Dr. F. J. Smith; Dr. H. Lyon Smith; Surg.-Gen. Sir Lionel Spencer, K.C.B., M.D., I.M.S.; Dr. S. Squire Sprigge; Lieut.-Col. Squier; Dr. Purves Stewart; Mr. J. Lynn Thomas, C.B., C.M.G., F.R.C.S.; Mr. C. J. S. Thompson; Mr. David Thomson, M.B.; Mr. J. G. Thomson, M.B.; Sir StClair Thomson, M.D.; Dr. H. H. Tooth, C.M.G.; Sir Frederick Treves, Bart., G.C.V.O., C.B., F.R.C.S.; Sir John Tweedy, F.R.C.S.; Mr. T. Jenner Verrall; Dr. F. Parkes Weber; Dr. Samuel West; Dr. W. Hale White; Dr. Dawson Williams, F.R.C.P.; Mr. Guy E. M. Wood, M.B.

After dinner the loyal toasts were given by the Chairman.

Lord BRYCE proposed the toast of "The President of the United States," and referred to the sympathy President Wilson extended to science, and particularly to applied science, as a means of improving the health of the people. The President had not taken a public part in political affairs, nor had he experience of the hustings before he became a candidate for the Presidency, but he was a conspicuous example of how a student of the history of peoples and nations, a man deep read in the motives that dominate mankind throughout the ages is fitted, provided he is endowed with judgment and clear-sightedness as the President is, to conduct the affairs of a great nation. Lord Bryce drew attention to the campaign against ankylostomiasis, which had been successfully conducted

in the United States, and to the formation of the International Health Commission, which was extending to the rest of the world, especially to British colonies and possessions, the experiences which had been acquired in the United States. The Commission, under Mr. Wickliffe Rose, was on its way to investigate ankylostomiasis in Egypt, Ceylon and the Malay States. The Commission was established by the Carnegie and Rockefeller Institutes, and the members had been given a cordial welcome by the Colonial Office authorities in Great Britain.

His Excellency the AMERICAN AMBASSADOR, in responding to the toast, thanked the assembly for the cordial way in which the toast to the President of the United States had been received. He looked upon the principle of action which seems to guide the President as one which he might style the scientific method of administration, and nowadays scientific methods must be the foundation of every undertaking, whether it be the work of governments or of investigators in the realms of disease.

SIR HAVELOCK CHARLES, G.C.V.O., in proposing Surgeon-General Gorgas's health, said: As President of the Society of Tropical Medicine and Hygiene I rise to propose the toast of the evening, "The Good Health of Surgeon-General Gorgas." Our guest has been doubly fortunate in his past: (1) He has had on two occasions great opportunities to show his powers; (2) he has successfully demonstrated, on both those crises in his career, by his grit, his knowledge, and his tact, the wisdom of the great man who selected him for such arduous tasks. The best was chosen, and, to give that best his chance, full powers and single responsibility were conferred upon him. There was the wisdom! It is not right to allow the energy of a man worthy of a great task to be used up in contesting with the quibbles of red tape, envy and ineptitude. Place upon such a one the whole responsibility, and, having done so give him a free hand. Havana, for centuries the hot-bed of yellow fever, was cleared by our guest of that scourge in nine months. The greatest labour, though, of this son of Ālkmēnē has been at Panama, where his effective organization put an end to the pestilence that, by means of the mosquito, had defeated that most gifted nation, the French, without their ever having dreamt of the source of the attack! The conquest of Panama was the conquest of the mosquito. The Americans succeeded, but the success was not due to superiority over the French in engineering skill, but to the thoroughgoing application by Surgeon-General Gorgas of the principles of scientific preventive medicine. The pessimists, of whom, in this land, we have more than enough, allow us no ground for boasting of our achievements in science more than in any other line. We can, though, on this matter that made Surgeon-General Gorgas's feat possible, put in a claim for credit, in that the discovery of the transmission of disease by the mosquito was due to our countrymen, Manson and Ross. Sir Ronald is here to-night, and, in congratulating our guest, we, I think, shall not be wrong in calling to mind Sir Ronald Ross's achievement, for the public is ever ready enough to accept the benefit conferred by science, but is too prone to ignore the benefactor. You all doubtless remember the old story of the city in dire peril about to be destroyed, but it is said, "Now there was found in the place a poor wise man, and he, by his wisdom, delivered the city, yet no one remembered that same poor man." As it was in the beginning, even so it is now. Surgeon-General Gorgas stamped out yellow fever and plague and controlled malaria. He abolished the panic of fear and the terror by night that these inspire. He proved that, by taking the necessary precautions, selected aliens could live in the Canal Zone, for a time, with but little more risk than at home. He inspired, in both his confrères and staff, confidence by his words, and enforced it by his acts. He has shown that tropical disease is subject to human control, and has thus given to sanitarians the world over a banner that may be displayed because of the truths of sanitary science.

What was the scene of his labours?—the common grave of past failures and worn-out reputations. As our Johnson has said of Scotland of the old days, it was a place where a man would rather choose to travel in than to live, and where he would find more to observe than to desire. Its neighbourhood has, for us, a great interest. May I recall to you that Nelson, as a captain, led there an expedition of 200 men—of that 200 but ten returned! Nelson himself long subsequently bore in his person marks of the illness contracted there. It gives one furiously to think how different might have been the history of the world had the hero fallen a victim to the diseases of the Panama belt that killed so many of his brave comrades.

Again, in more recent times, our Consul-General at Panama; survey party of twenty (Germans and English); Consul-General offered to accompany; was refused; insisted; went; in three days returned alone! The twenty were dead! Of what? Of the endemic diseases of Panama! Of those of which our guest has made a conquest!

It has been estimated that in the construction of the railway across the isthmus that for every sleeper laid down on the permanent way a man died of disease. Truly, sirs, this is the country where the pestilence walked in darkness and destruction by noonday, where at the side of the survivor a thousand fell and at his right hand 10,000 died.

Surgeon-General Gorgas will have a place in the esteem of posterity, as a man of will as well as of inauguration, of reason as well as of art, of diplomatic tact as well as of warm-hearted impulse. To his own natural gifts of insight he has added everything that modern preventive science can confer. In a great work it is the man that is everything. Truly it has been said that genius is the yeast that makes the dough of knowledge to rise. His genius applied with unequalled success the doctrines of yellow fever prevention—promulgated by the Havana Yellow Fever Commission. His genius utilized to the full the discoveries of Manson and Ross. That great people, the Ancient Romans, had a proverb: "The man lives unworthily through whom no other person lives." Sirs, how many are now alive who would have died in this great

engineering feat had it not been for the labours of our guest? As the Romans would have said of him, we say of Surgeon-General Gorgas, he has lived worthily.

As Britishers we congratulate our kinsmen across the seas in the successful accomplishment of that magnificent work, the Panama Canal.

As medical men we congratulate a confrère for rendering possible the carrying out of that arduous undertaking—an undertaking that, in the past, was rendered impossible by the scourge of tropical disease; an undertaking that, in spite of engineering skill, would even now have been impracticable but for the intelligent application by our guest of the recent discoveries of scientific medicine, which, sirs, made that Herculean labour feasible!

As his hosts this evening we honour ourselves in doing him courtesy.

We wish him the work in the future which his merit deserves. But we do not wish for him rest, for "joy's soul lies in the doing."

Sirs, I ask you to drink to the health of our guest —Surgeon-General Gorgas!

Surgeon-General GORGAS replied to the toast, which was enthusiastically received, in the modest terms characteristic of the man. He stated that, of the 60,000 labourers engaged in the construction of the Canal no fewer than 45,000 were coloured subjects of the British Empire. The men hailed from the West Indies, and almost all belonged to the Church of England; whether this accounted for their good behaviour or not he could not say, but better behaved or more orderly and willing workers it would be difficult to find, and in comparison with the negroes in other parts of the world they seem altogether exceptional. One or two amusing things happened in connection with their employment; so marked was their religious fervour that when they left the Bibles, which had been provided for their use, disappeared with them. They, moreover, claimed the Panama Canal, lock, stock and barrel, as their doing, and certainly their arduous labours were most commendable. On one occasion the faith of the men in the British Empire faltered; this was owing to a change in the method of payment that was adopted without due notice: it was suddenly arranged that instead of paying cash to the men that they should be paid in postal orders payable at the Post Office in Barbadoes, from whence most of the negroes came. The sudden call upon this office of many thousands of orders to be cashed taxed the resources of the office so severely that because the money was not immediately obtainable the report got about that the British Empire was bankrupt. By another week, however, provision was made for these payments, and confidence in the British Empire was restored. He appreciated highly the kindness with which Major Noble, Dr. Darling, and himself had been received everywhere in England, and referred to the pleasure he had felt on this, his first, visit to London to see places, streets and buildings with the names of which he was perhaps more familiar than he was with places and streets in New York, and he forbore to describe his feelings when he found himself in Westminster Abbey, St. Paul's Cathedral and other places which were heretofore mere names to him, and actually walk along streets where Dickens's and Thackeray's heroes had trod.

Sir WILLIAM OSLER, Bart., F.R.S., proposed the toast of "The Chairman," to which Sir THOMAS BARLOW fittingly responded.

ADDRESS BY SURGEON-GENERAL GORGAS ON SANITARY WORK IN THE PANAMA CANAL.

ON Monday, March 23, Surgeon-General Gorgas addressed a large meeting at the Royal Society of Medicine. The President of the Society, Sir Francis Champneys, Bart., occupied the chair.

In his address, Surgeon-General Gorgas gave a description of the area along which the Canal was constructed. The length of the waterway is about 50 miles, and it runs almost due north and south. Two-thirds of the extent was mountainous, or rough broken uplands, whilst one-third of the length was through a low, swampy district. The moisture and warmth of the district was such that it presented an ideal breeding ground for mosquitoes. The different zones of the Canal were divided into sanitary districts in charge of specially appointed officers. Drainage was the stable method employed to keep down the mosquitoes. The "drains" were of different kinds, according to circumstances; some were ditches, some were surface drains, but whatever their nature they had to be kept clear, for ditches get grass-grown quickly; but the best of all was one made of subsoil tiles. The grass on either side of the Canal, for a distance of 200 yards, had to be kept cut close, otherwise the mosquitoes sheltered in the long grass from the sun and wind, which are destructive to their existence. Where drainage is impossible oil is useful, and for a time as many as 1,000 barrels a month were being used for this purpose. Quinine also was given freely during the construction, but drainage is the great prophylactic against malaria and yellow fever.

As examples of the efficacy of the measures adopted, Surgeon-General Gorgas stated that whereas in 1906 not fewer than 820 out of every 1,000 persons engaged in the Canal were admitted into hospital with malaria, in 1913 the number dropped to 47 per 1,000. The death-rate amongst negroes in 1906 amounted to 45 per 1,000, in 1913 it was reduced to 5 per 1,000. Amongst whites the death-rate fell from 11 per 1,000 in 1906 to 2·5 per 1,000 in 1913.

Major Noble showed a series of lantern slides of the work in the Canal in its several phases. The cost of the sanitary work, over which Surgeon-General Gorgas presided, amounted to about £80,000 a year, from 1904 to 1913.

ON March 18 Surgeon-General Gorgas was entertained at dinner by the Director-General of the Army Medical Service and the officers of the Royal Army Medical Corps, in their mess at the Royal Army Medical College, London.

Abstracts.

A SKIN REACTION INDICATIVE OF IMMUNITY AGAINST TYPHOID FEVER.*

By Frederick P. Gay, M.D., and John N. Force, M.D.

Certain of the antibody tests, particularly the agglutination reaction and the reaction of fixation, are of recognized value in the diagnosis of typhoid fever; they are, however, of no certain significance as measuring actual resistance to typhoid infection. We have simply to mention that a high agglutination reaction affords no assurance of protection against a relapse in the disease, and, on the other hand, that it is well recognized that those who have recovered from typhoid fever soon fail to give the reaction in the majority of cases, although they are usually protected for life from a recurrence of the disease.

Technique.

The method of applying the typhoid skin test is a modification of the von Pirquet method of tuberculin testing. It consists in producing an abrasion of uniform size and depth designed to cut just through the epidermis of the arm without drawing blood. This abrasion is produced by a complete twist of a chisel with straight edge (measuring 2·25 mm.) and square corners, supplied on specification by the Cutter Analytic Laboratory, and so tempered as to resist sterilization by burning alcohol. The skin is prepared by cleansing with 95 per cent. alcohol. Various preparations of the typhoid bacillus have been tried with varying success, and the one actually chosen as the most efficient is prepared in a manner similar to the one employed in producing Koch's old tuberculin: 250 c.c. of 5 per cent. glycerin bouillon was inoculated with *Bacillus typhosus* (Dorset Army Strain No. 5) and incubated for five days. It was then reduced without filtration to one-tenth of its original volume by evaporation over a 56 acetone bath for about eight hours. A control solution of sterile 5 per cent. glycerine bouillon was evaporated at the same time to equivalent volume.

Two uniform abrasions are produced on the upper arm or forearm of each patient tested, and the control solution gently rubbed into the inner spot with a sterile toothpick, and the "Typhoidin" solution similarly applied to the outer spot. The reactions are observed six and twenty-four hours later, and more rarely at subsequent periods. In a very few instances the six-hour period shows in positive cases an accelerated reaction which diminishes or actually disappears within twenty-four hours. Not infrequently, however, a positive test persists for a week. In the majority of cases the control spot shows a 2 mm. healed abrasion not surrounded by an areola; in the minority of cases a slight zone of traumatic or irritative redness may occur about the abrasion. In these latter cases when there is a positive reaction in the "Typhoidin" spot there is no difficulty in noting and measuring the differences between its areola and the control redness. We have arbitrarily chosen a difference of 2·5 mm. between the two areolas as indicative of a positive reaction. The positive spot measures from 4 to 12 mm. in extreme diameter and is usually somewhat indurated and frequently clearly demarcated. In negative cases there is the same reaction or absence of reaction in the control and "Typhoidin" spots. In the routine examination, as a rule, twenty or more cases representative of the various categories were tested at a time, after history-taking, and to avoid prejudice, the nature of the reaction decided on before the history was referred to.

Conclusions.

A preparation of the typhoid bacillus ("Typhoidin"), in all respects similar to Koch's old tuberculin, produces a clear-cut cutaneous reaction by the von Pirquet method in 95 per cent. of cases that have recovered from typhoid fever (20 cases positive out of 21). Two of the cases had suffered from the disease forty-one and thirty-three years before, respectively. The reaction is negative in 85 per cent. of individuals without history of typhoid fever (41 cases tested). The 9 per cent. of these supposedly control individuals that gave a distinct positive reaction may be suspected of having had a mild and undiagnosed attack of typhoid fever. Of fifteen individuals vaccinated by the Army method from four and three-quarter years to eight months previously, nine gave a positive skin reaction. Twenty-five individuals vaccinated by the Gay-Claypole sensitized vaccine for from one to eight months previously gave uniformly a positive reaction.

It is suggested that the test is of presumptive value in indicating protection against typhoid fever whether acquired by recovery from the disease or by artificial immunization against the disease. The test may eventually be used as an indication for re-vaccination in the individual case.

* *Archives of Internal Medicine*, March, 1914.

EXAMINATIONS FOR HOOKWORM OVA.*

By Mark J. White.

Technique for the Examination of Fresh Material and for making Permanent Mounts of the Specimens.

(1) Agitate about 0·5 grm. of fæces with 5 or 6 c.c. of water in a small test-tube. The centrifuge tube is suitable.

(2) Strain through two layers of gauze to remove the too consistent particles of fæces, and wash the residue with a sufficient quantity of water so that the total filtrate will properly fill a centrifuge tube.

(3) To the tube of filtrate add and diffuse therein five drops of a 1 per cent. solution of "Toluidinblau" in a 2 per cent. aqueous solution of carbolic acid.

(4) Centrifugate sufficiently, two minutes.

* "United States Public Health Report," February 20, 1914.

(5) Decant all supernatant fluid.

(6) Place two loops of the sediment on a slide and spread by gentle pressure with a cover-glass.

(7) Magnify 105 times in a subdued light (oc. 4, ob. 3 Leitz).

The dye imparts blue and purple tints to the fæcal material and a light-brown tint to the egg-shells. This polychromatic effect greatly facilitates the locating of the eggs, which are then magnified 370 and 1,000 times for the purpose of more definite identification of the blastomeres (oc. 1, ob. 7, and oc. 4, ob. $\frac{1}{12}$ oil Leitz).

These stained specimens may be satisfactorily mounted by rimming with melted paraffin. In such mounts the complete development of the egg, including the first embryonic stage, may be watched. As the egg becomes mature and the shell disintegrates, the embryo, whether dead or alive, takes on a purple colour, as the result of coming in contact with the small quantity of unattached stain present in the mount. As long as the egg-shell remains intact its colour is light brown, but as soon as it permits the unattached dye to come in contact with the contained embryo the colour of the egg changes, so that instead of a light-brown egg there is a purple egg.

In some instances the embryos entirely escape from their egg-shells and lie free in the field, but dead, having taken a beautiful purple colour. In others they remain coiled up dead in the egg-shells. This change increases the value of permanent mounts, as some of the eggs may remain brown, while others show the embryos stained purple. It is necessary to avoid pressure on these mounts, as the embryos are very fragile, and the movement of the surrounding air-bubbles is likely to cause fracture and displacement.

A PULMONARY ATTACK SIMULATING PRIMARY LOBAR PNEUMONIA, CAUSED BY PULMONARY EMBOLISM AND INFARCTION FROM A LATENT VENOUS THROMBOSIS.*

By Lewis A. Conner, M.D.

(1) In the common forms of venous thrombosis, such, for example, as is seen as a complication of typhoid fever, and such as so often supervenes after childbirth and after certain surgical operations, there is regularly a period of days or even weeks during which the course of the thrombosis is either altogether latent or is indicated only by slight and equivocal symptoms; and the classical signs of phlegmasia alba dolens appear only late in the process, or may indeed be lacking altogether. Moreover, the formation of the primary or white thrombus is the result of the gradual deposition of blood platelets on the walls of the still patent vein, layer on layer, in a manner somewhat comparable to the formation of a bar by the deposit of silt in a flowing stream. There is reason to believe that the characteristic local signs of thrombophlebitis appear only after the occlusion of the vein has become complete, and after more or less periphlebitic inflammation has been added.

(2) Pulmonary embolism and infarction is a much more frequent complication of venous thrombosis than is commonly supposed. It occurs in two quite distinct forms, which differ much in their time of appearance, their clinical course, and their prognosis. There is first the massive and usually fatal embolus caused by the separation and mobilization of a large fragment of a thrombus, occupying and occluding some such large vein as the femoral or iliac. The emboli occur late in the process of thrombosis and are fortunately rare; but because of their suddenness and the gravity of their symptoms, they are the ones to which attention has been chiefly directed. The second form of pulmonary embolus is of much more frequent occurrence. It appears early in the process of thrombosis, often, indeed, days or even weeks before the local signs of thrombophlebitis are recognizable, so that frequently it is the very first manifestation of that condition. Its symptoms are usually mild and are often interpreted as those of an ordinary pleurisy or pneumonia. These small, early emboli almost certainly arise from the separation of tiny particles from the primary, mural thrombus while the blood is still flowing in the affected vein. This thrombus, as has been said, is formed by the gradual deposit of agglutinated blood platelets, and it is easy to see how such freshly deposited clumps of platelets should be separated from the thrombus and carried away in the blood-stream to be lodged finally in the lung capillaries.

(3) Venous thrombosis occurs not so very rarely in individuals who are apparently in good health, or who at least are not obviously sick. The literature contains many instances of such thrombosis in girls with simple chlorosis, in men with gout, in cases of varicose veins of the legs, and even in persons who seem to be quite well. In some of these latter cases syphilis seems to be the underlying cause of the trouble.

The evidence furnished by the four cases will, it is believed, be found to be convincing that the cases were actually instances of pulmonary embolism and infarction, and were not examples of primary pneumonia, as they at first appeared to be. Unfortunately the evidence of this fact is purely clinical, as the cases all recovered; but this is true also for most of the cases of early pulmonary infarction seen with the venous thrombosis which complicates typhoid fever. Nevertheless, in these latter cases the clinical evidence is overwhelming. The present cases are analogous in every respect to those complicating typhoid fever.

In Case 1 the onset was exactly like that of a primary pneumonia, except for the absence of a rigor, and no doubt was entertained at first as to the correctness of the diagnosis. But the frankly bloody character of the sputum, which continued

* Presented at the Section on Medicine of the Seventeenth International Congress of Medicine, London, 1913. From *The Archives of Internal Medicine*, March, 1914.

day after day, soon raised a suspicion of the true nature of the condition, and we were able to predict with some assurance the ultimate appearance of the venous thrombosis, which gave its first local signs seven days after the onset of the pulmonary symptoms. In this instance the bloody sputum lasted for twenty-one days. Concerning the physical signs, it is to be noted that the signs of consolidation appeared first in the left lower lobe, and a few days later in the right lower lobe, and that gradually these signs changed so as to give the impression that there was present more or less fluid in both pleural cavities, although the aspirating needle failed to show any.

In Case 2, a luetic man, the physical signs were those of a small area of consolidation near the lower angle of the left scapula, which disappeared within two or three days. In this case also the sputum was composed chiefly of blood and bore no resemblance whatever to the rusty, tenacious sputum of pneumonia. On questioning the patient, the fact was elicited that several days before the appearance of pulmonary symptoms he had had, for a day or two, some pain in the calf of his right leg. When first seen by me, toward the end of his illness, a distinct indurated cord could be made out in the left calf, which did not correspond to any of the normal structures there, and which seemed to me clearly to represent a thrombosed and thickened vein. A very interesting feature of this case was the appearance of sudden and severe pain in the left side of the neck and in the suprasternal notch, which came on some thirty-six hours before the advent of pulmonary symptoms. The peculiar location of this pain is characteristic of irritation of the central portion of the diaphragmatic pleura, and in this instance the pain suggests that there had been a small infarct somewhere on the central portion of the lower surface of the lung before the occurrence of the larger infarct, which gave the more characteristic symptoms and signs.

Case 3 was that of a man with fairly marked chronic nephritis, which, however, did not prevent him from carrying on his daily work—an occupation that required him to be constantly on his feet. In this instance the diaphragmatic location of the infarct is seen by the fact that the symptoms (pain, tenderness and muscular rigidity) were at first abdominal rather than thoracic. In this case (the only one among the four) the sputum was very scanty and was at no time bloody. The signs of consolidation lasted only about two days. The clue to the true diagnosis came only when signs of phlebitis appeared some days after the pulmonary signs. Then was elicited the fact that, for several weeks before his illness, he had had dull pain and soreness in the right calf, with some local swelling.

In Case 4, the interesting features were the character of the sputum, and the fact that two weeks after the subsidence of the first pulmonary attack there were indications of the occurrence of a small embolus in the other lung.

To recapitulate, then, we have in three of the four cases sputum which consisted chiefly of liquid or clotted blood, and in no case sputum which bore any resemblance to the characteristic sputum of pneumonia; in every case the physical signs differed in some respect from those usual in pneumonia—in two cases by the short duration of the signs of consolidation, in one by the absence of frank signs of consolidation, and in one by the anomalous and protracted pleural signs; in all the cases there were indications that the pulmonary lesions were multiple; in none of the cases was there an introductory rigor; in three of the four cases the temperature chart bore little resemblance to the usual chart of pneumonia, and, finally, in three of the four cases there were points in the history to indicate that venous thrombosis existed before the onset of the pulmonary symptoms.

No one of these facts alone would be entitled to much weight in the attempt to differentiate these cases from those of primary pneumonia, but taken together they form a mass of evidence sufficient, I think, to warrant the conclusion that all of these cases were instances of pulmonary embolism and infarction.

That it may be quite impossible at times to say positively whether the venous thrombosis, which declares itself after the appearance of the pulmonary trouble, is the cause or merely the result of this is freely admitted, but in most cases a careful study of the symptoms and a patient inquiry into the history of the case will, I believe, provide one with sufficient data to clear up the uncertainty.

MANILA BUREAU OF HEALTH REPORT FOR THE THIRD QUARTER OF 1913, DATED OCTOBER 20.

By Victor G. Heiser, M.D.

Plague.—The editor of the *Manila Daily Bulletin*, who had his office in the Stewart Building, was taken violently ill on September 19 and on September 20 his case was definitely diagnosed as one of plague. On September 22 he died. The diagnosis was completely confirmed by laboratory methods.

While carrying out the insecticidal and other anti-plague measures in his office a mummified rat was found in a drawer of his desk. There were also in the drawer a number of live fleas, one of which was captured and identified as the rat-flea (*Pulex cheopis*). Stained specimens from this flea showed bipolar staining organisms that were identical with those of plague. The mummified rat or large mouse which was found in his desk was ground up, and inoculations made from it into healthy laboratory rats produced typical cases of plague in them. During the examination of the storehouse of the grocery store, the kitchen of the restaurant, and other rooms which are on the first floor of the building in which the offices of the *Manila Daily Bulletin* are located, four other dead rats were found that had all appearances of having died of plague.

It was also learned that on September 20 a Chinaman who was employed in the grocery store had died very suddenly and been quickly buried.

On account of the suspicious circumstances the body was exhumed. There were enlarged glands and other lesions, however, which indicated that death might have been due to plague, but on account of the advanced state of decomposition which had set in it was impossible to confirm the diagnosis biologically.

Cholera.—After an absence of over two years a case of cholera was discovered in the city of Manila on August 24 and another on August 25.

The first case occurred in the person of a Filipino who worked as a carpenter in one of the local hotels, but was said invariably to have taken his meals and slept at his residence. On Saturday evening, August 23, he left his place of employment apparently in good health. About noon the next day he was seized with violent pains in the stomach, which later in the afternoon increased in severity, and in addition marked pains began in the muscles of the calves and forearms. Though there was no diarrhœa, the case presented many of the clinical symptoms of cholera and the patient was ordered to be transferred to the cholera hospital. The man was in a moribund condition when he arrived at about 10 p.m., and died a few minutes later. At the autopsy which was held on the morning of August 25 the typical pathological lesions of cholera sicca were present. The lower bowel contained a large amount of hard, formed fæces. A liquid rice-water-like fluid was found in the ileum, cultures from which, prepared in accordance with the procedure recommended by the Internationale d'Hygiène Publique Conference, resulted in the isolation of the true cholera vibrio.

The next case came under observation on August 25, and occurred in the person of a Filipino who was employed as a cook to a British family in a suburb of Manila and a number of miles removed from the first case, and so far as could be ascertained there was no connection between the two cases. This person gave a history of having been ill with diarrhœa and cramps in the muscles of the extremities for a period of about a week. It was at this time that he came under observation and was transferred to hospital. He was found to have rice-water stools, cramps in the muscles of the legs, suppression of urine, husky voice, subnormal temperature, and other well-recognized clinical symptoms of cholera. Cultures made from his stools resulted positively for the cholera vibrio.

No further cases of the disease were discovered until September 13. The first eight cases occurred in widely separated sections of the city and the most faithful investigation failed to trace any connection whatsoever between the cases. After that, however, there have been a number of instances of contact infection. Since the beginning of the outbreak on August 24 to October 20 there have been seventy-two cases, of which forty-five died.

A most noteworthy fact in connection with this outbreak is the frequency with which true cholera vibrio carriers are found among the contact groups of the true cases of cholera.

Of seventy-two contact groups examined forty were vibrio carriers of some kind and twenty-nine were true cholera carriers. These results show the desirability of having adequate laboratory facilities for examining large groups of the population in order to ascertain to what extent infection exists among them.

The first case discovered was in a person who had not been out of Manila for many months previous to his illness, nor did he associate with persons from foreign parts or eat imported food in a raw state. At the hotel at which he worked no guest from a foreign country had registered for over seven days prior to the date on which the cholera occurred.

As far as known there has been no cholera anywhere in the Philippines since October, 1911, and careful investigation fails to show that the disease was introduced from a foreign country by food or persons. The importation of vegetables or other food, which might be eaten in a raw state, from any country except Australia and the United States is prohibited. From the foregoing it is apparent that the origin of the present cholera outbreak cannot be definitely traced. There is considerable evidence from an epidemiological standpoint that cholera carriers are always present in the Philippines and under certain circumstances they are capable of transmitting the disease.

As in former outbreaks, prior to true cases of cholera having been found, at intervals of a few weeks a number of deaths occurred which were attributed to acute nephritis and were in persons who had the symptoms of ptomaine poisoning. Similar experience had in former outbreaks suggests the belief that these cases may perhaps in some way be associated with cholera outbreaks in the Philippines.

Measures employed to combat it.—All cholera cases were promptly transferred to hospital. Disinfection of the premises was made with larvicide or carbolic acid, particular attention being given to the toilets, bed upon which the patient slept, his clothes, and other articles and things that might have become infected with cholera discharges. All contacts were required to wash their hands in a disinfecting solution. In addition, a stool specimen was taken from each one of them, and in all cases in which they were found to harbour the cholera vibrio they were transferred to hospital for observation and detention. In sections of Manila in which cholera occurred general disinfecting measures were carried out with respect to tight vaults or other receptacles into which cholera organisms might have been deposited and from which there might be any danger that flies, roaches, or other insects might carry them to food supplies.

Mortality Record.—In spite of the fact that cholera appeared during the latter part of the quarter—a mortality of 22·08 per 1,000 per annum for the quarter, which is lower than that for many cities of the United States, and if the high infant mortality could be excluded, or, in other words, if comparisons were made of deaths that occur among persons over 1 year of age—Manila would be found to have a death-rate which would compare favour-

ably with even the healthiest cities of the United States.

Leper Collection.—Two hundred and seventeen were collected and transferred to the Leper Colony, making the number of inmates 3,350.

As the police system in the Philippines gradually improves it becomes more and more apparent that there is still a considerable number of cases of leprosy of long standing at large, so that the rapid reduction in the number of new cases of leprosy which had been hoped for after the segregation of the lepers was supposed to have been completed can scarcely be expected as yet.

Vaccination.—Much difficulty is experienced in impressing upon local health officers the necessity for carrying out these instructions rigidly, and their failure to do so has in a number of instances been responsible for outbreaks of small-pox among the unvaccinated.

Typhus Fever.—Several cases of a disease resembling typhus fever were reported. One of the cases occurred in an American, and his clothing and other effects were most carefully examined in order to ascertain whether the *Pediculus vestimenti* could be found, but all of these efforts were negative, and it is reported by the Bureau of Science that up to the present time it has not been possible to find this insect anywhere in the Philippine Islands. On account of the fact that the *P. vestimenti* is regarded as the only intermediate host, there is considerable reluctance to make a positive diagnosis of typhus fever in these cases.

Cerebrospinal Meningitis.—During May a case of cerebrospinal meningitis occurred in a sailor who worked on a lighter. The case was treated in hospital and the diagnosis was confirmed by autopsy and the *Meningococcus intracellularis* was found.

During June and July eight cases were reported at a railway camp. The examinations made of the cerebrospinal fluid in two of the cases revealed the *M. intracellularis*. Since that time three additional cases have occurred.

TRACHOMA IN STEEL MILL WORKERS.*

By J. W. Schereschewsky.

The Youngstown Sheet and Tube Co. reported to the State Board of Health the presence of trachoma among their employees and a medical officer, sent by the State Board of Health, examined about twenty-five men who had been dropped from the rolls of the Company.

At the time the disease was discovered at the plant the community had become considerably excited over the danger. The cases were collected and segregated in the town gaol. They were discharged later, and what became of the patients could not be learned, though some of them had been returned to work by the Company.

The eyes of as many as practicable of the factory personnel were examined, therefore, in order to establish the rate of trachoma prevalence, and an inspection of the sanitary conditions of East Youngstown was made (previously stated to be bad by Dr. McCampbell), in order to determine the extent of the disease in that community, outside of the mills, and to note the general sanitary conditions and the existing opportunities for the spread of trachoma in schools and lodging-houses.

The writer acknowledges the cordial co-operation of the Youngstown Sheet and Tube Co. in this investigation, and the assistance rendered when examining the mill operatives in other ways.

Number of Employees.—The full complement is about 8,500 hands. At present only about 80 per cent. are at work, the number on the pay rolls at the time of investigation being 6,372; 5,962 employees, about 95 per cent., were examined, 410 being office employees, those unwilling to be examined, or others on continuous night duty not accessible for examination.

Nationality of Employees.—According to Mr. D. W. McClure, of the Company's Employment Bureau, representatives of twenty different races and nationalities are employed at the works. Table 1 sets forth the percentage of each nationality when the Company was employing 7,518 persons. The percentages given are approximately correct for the present force; 28·5 per cent. of the employees are Americans, 71·5 per cent. belonging to various foreign nationalities. Slovaks, Croatians, Roumanians and Poles form 63 per cent. of the alien representation.

Prevalence of Trachoma among the Employees.—Examination revealed 76 cases of trachoma, a rate of prevalence of 1·3 per cent. In addition, 19 cases of suspicious conjunctivitis were observed in individuals presenting inflammatory eye symptoms of recent origin, suggestive of the onset of trachoma, but positive diagnosis was impossible at the time of examination.

Racial Distribution of Trachoma Cases.—Eighty per cent. of the cases of trachoma found were in three races—Roumanians, Croatians and Magyars—who form only 28 per cent. of the total number examined.

Severity and Duration of the Infection.—The observations are thought sufficiently reliable to justify the inference that the disease has for some time been slowly increasing among the factory personnel, seeing that in some 42 per cent. of the cases infection was recent, certainly less than six, and in several instances less than three months in duration. The inference as to gradual increase is further strengthened by the cases of "suspicious" conjunctivitis previously mentioned.

Length of Residence of Trachoma Cases in the United States.—With but few exceptions the disease was probably contracted subsequent to landing in the United States, and in the great majority of instances while these individuals were in the employment of the Youngstown Co.

Trachoma is most prevalent in the tube mill and in the yard and construction gangs. This does not seem due to any special conditions in these depart-

* "United States Public Health Report," March 6, 1914.

ments favouring the spread of trachoma, but to the fact that they employ the greatest percentage of Roumanians, Croatians and Magyars, who, as already shown, present the highest incidence of the disease.

Dissemination of Trachoma in the Mills.—It is not probable that dissemination of trachoma is more than occasionally effected by the washing facilities used in common at the mills. Like most steel plants, there are practically no washing facilities provided by the Youngstown Sheet and Tube Co. except for the office force. They have paper towels, which are destroyed after being used once.

The workmen either go home without washing, use their buckets, or the troughs where tongs and similar tools are cooled off after handling hot metal. The amount of trachoma observed in skilled workmen was not significant. The relative absence of the disease among the more highly paid skilled contingent who do wash up before leaving showed that the disease has not been extensively transmitted by the use of common towels and washing utensils at this plant.

In addition to the conditions just discussed some cases of trachoma may have been acquired at the plant through the practice of removing foreign bodies from each other's eyes. While the regulations of the Company require all workmen to go for relief to the Emergency Hospital maintained by the Company, if the foreign particle consists merely of dust or cinder, the workmen frequently have recourse to each other for assistance. It is possible for a trachomatous individual, using his presumably infected fingers or handkerchief for the purpose, to infect the eyes of a fellow-workman, or, conversely, a trachomatous subject, believing from the ocular sensations caused by the disease that he has a foreign body in his eye, similarly to infect the fingers or handkerchief of the workman who undertakes to remove it.

The impression gained was that conditions favouring the spread of trachoma could not prevail in the steel plant to the same extent as in the workmen's homes and lodging-houses; therefore attention was directed to the sanitary conditions and their relation to the dissemination of the disease.

Sanitary Conditions in East Youngstown.—As the majority of alien employees are either single, or their families are in Europe, they live mostly in lodging-houses in East Youngstown. The sanitary conditions there were most unsatisfactory. In lodging-houses they were such as not only to facilitate the spread of trachoma or of any communicable disease, but to cause wonder that the disease is not even more prevalent.

A river is close to the plant of the Youngstown Sheet and Tube Co. Many streets are practically ungraded and sidewalks are, for the most part, absent. Though a line of sewer has been laid almost all the houses are still unconnected.

The garbage is dumped in the rear of houses where it is apt to remain until disintegrated by the elements. A water company has laid pipes in the town, but only a few houses are supplied. The great bulk of the water is derived from shallow driven wells, each house having its pump. Sanitary conditions are practically *nil*, and many of the wells are exposed to pollution.

As workmen of the same race often live in the same section of town the lodging-houses exhibited many instances of extreme overcrowding. In one case there were twenty-three lodgers in a four-room house, and it was not uncommon to find a single room occupied by from eight to twelve workers, who, for the most part, slept two in a bed. In some houses, where the men work on both "day and night turns," the occupation of the beds is almost continuous, the night men taking, during the day, the places of those sleeping at night.

The beds themselves were usually old, filthy, and destitute of linen, the covers consisting of old bedquilts. The washing facilities consisted of buckets or hand basins, used in common by all the occupants of a room. The houses themselves were built close together, the rooms dark, and very few of them susceptible of thorough ventilation. All windows were found carefully closed and the temperature was still further raised by small stoves.

Examination of the East Youngstown Schools.—All the pupils (652 in number) in the East Youngstown schools and teachers were examined, with the result of finding ten cases of trachoma, a rate of prevalence of 1·53 per cent.

The greatest number of cases of trachoma existed in one school; with 270 pupils, or about 41 per cent. of the entire number examined, there were eight cases of trachoma, 80 per cent. of the total cases of the disease found among the scholars. This school is situated in that district having the greatest number of lodging-houses. No cases were found at the school located at the extremity of the town nearest Youngstown. The sanitary conditions are better here, the houses less closely spaced, and the proportion of Americans higher.

While the rate of prevalence of the disease among the East Youngstown school children is not very high, being about 1½ per cent., the disease is, nevertheless, present, and some action on the part of the local authorities is needed to prevent its further dissemination.

Conclusions.

(1) The origin of the prevalence of trachoma is readily accounted for by the presence among them of chronic cases, some of which are even now in a state of acute exacerbation.

(2) The crowded insanitary condition of the lodging-houses amply accounts for the spread of the disease.

(3) The presence of recent cases of trachomatous infection shows that under existing conditions the disease is gradually being spread. Unless measures are now undertaken for its control the disease will gradually gain such headway as to prevail in epidemic form.

(4) It seems evident that so long as the present insanitary conditions obtain the control of trachoma will be difficult or impossible.

In view of the fact that some 80 per cent.

of the taxes of the town are paid by the Company, and that 60 to 70 per cent. of their personnel, including nearly all the foreign element, live there, it would seem the Company is more directly interested in the sanitary conditions than anyone else.

The efficiency of its employees is affected, not only by their environment when at work, but also by that of their homes. When workmen are exposed to insanitary surroundings during their period of rest, not only do they incur the danger of contracting communicable diseases, but their ability to recuperate from their previous labour is adversely affected by the prevailing unhealthful conditions.

Any effective treatment of the situation must necessarily include specific measures to be adopted at the mills and also the betterment of the sanitary conditions if permanent results are to be secured.

The recommendations made were twofold; first, the treatment of the situation at the mills; and secondly, the sanitation of East Youngstown.

Besides calling the attention of the Company to the usual means for preventing trachoma, such as avoiding the use of the common towel and hand-basin and the same bed by two or more individuals, the following special recommendations were made to put into effect at once:—

(1) No time should be lost in securing a competent physician on full time, at an adequate compensation, who should perform the following duties:—

(*a*) Make a complete mental and physical examination of persons applying for employment with the Company.

(*b*) Give competent treatment to any individuals found to be afflicted with trachoma or other communicable diseases.

(*c*) If the necessary arrangements could be made this physician could also be the health officer for East Youngstown and supervise its sanitary condition.

(2) A competent graduate trained nurse should be secured who would be able to administer treatment to trachoma cases under this physician's direction.

(3) All individuals suffering from trachoma should be segregated, preferably in some building controlled by the Company, and given competent medical treatment until such time as the infectiousness of the disease has been removed. They could then be allowed to return to work conditionally upon their reporting daily to the hospital for inspection and treatment.

(4) All persons suffering from trachoma, including those segregated in the manner referred to, should, upon their return to work, be required to report for inspection and treatment twice daily at the hospital. It was suggested that these persons secure their time cards at the hospital and the fact of their having there reported, on going in and out, be attested by a special stamp kept at the hospital.

(5) In order to prevent the development of subsequent cases, foremen, or those in charge of gangs, should be required to submit semi-weekly reports as to the appearance of the eyes of men under their control. Such reports should not be perfunctory, but state affirmatively or negatively whether they have observed any cases of reddened or sore eyes in any of the men under their charge. Whenever this was seen such workmen should be sent at once to the hospital for examination.

The following recommendations as to the improvement of the sanitary conditions were made, their realization to constitute part of the future policy of the Company, as an equivalent for the large taxes paid by the Corporation:—

(1) The provision of an adequate and pure water supply.

(2) The installation of a water-carriage sewer system.

(3) The abolition of insanitary privies.

(4) The installation of catch basins and sewers for disposal of storm waters.

(5) The installation of a system of garbage collection and disposal, with ordinances as to the use of sanitary garbage cans with tight-fitting covers.

(6) Restriction of overcrowding in lodging-houses and regulation of their sanitary condition by a system of licensing and inspection.

(7) Numbering of houses and grading of streets.

(8) Physical supervision of the children in the schools.

(9) The appointment of a properly qualified physician as health officer.

(10) Establishment of a hospital and dispensary in East Youngstown.

A STUDY OF EPIDEMIC DYSENTERY IN THE FIJI ISLANDS.*

By P. H. Bahr, M.A., M.B., D.T.M. & H.Camb.

The observations recorded in this paper were made in the Fiji Islands during the year 1910.

In former days these dysentery epidemics were of great virulence; the newly imported Solomon Island labourers were specially attacked; thus Daniels reported one such epidemic in which the death-rate was 48 per cent.

At the present day, probably owing to better medical service and hygienic conditions, the case mortality from dysentery of all kinds is not nearly so high as formerly, and amongst the Fijians, according to the official records, is about 16 per cent.

During the year 1910 some 170 well-marked dysentery cases were studied in detail at the Colonial Hospital, Suva, the capital of the group; of these only 11 were found to be of amœbic origin —that is to say, vegetative amœbæ bearing the characteristics of the *Amœba histolytica* of Schaudinn were found in the stools. In the dysenteric discharges of the other 159 cases no amœbæ were ever found.

The epidemic dysentery affected members of the various nationalities — Indian, Fijian, Solomon

* Abstracted from paper in the *British Medical Journal*, February 7, 1914.

Islanders, Europeans, and half-castes—to an equal degree as far as could be ascertained.

In Fiji, as in more temperate zones, epidemic dysentery is an institutional disease; some 53 per cent. of the patients under observation were prisoners undergoing sentences in either of the prisons of Suva.

Clinical Observations.

Cases from which the dysentery bacilli were isolated varied greatly in their clinical manifestations—from a mild catarrhal condition, in which the stools were solid and coated with a small amount of blood and mucus, to a fulminating one, in which the call to stool was incessant, and in which the patient, overwhelmed with pain, physical exhaustion, and toxic absorption, would succumb in from two to three days from the commencement of the attack. The temperature also varied within wide limits; cases were encountered in which it was subnormal throughout, others in which it reached 103° F. and over. No special dysentery bacillus was found to be associated with any clinical type of case.

No hepatic symptoms in life or suppurative lesions of this organ *post mortem* were ever encountered in this infection.

Epidemiology.

In studying the epidemics of dysentery which have occurred in Suva in recent years, one is struck by the fact that the maximum incidence of the disease occurs during the months of December, January, February, March, and April, the period of the highest mean temperature and of the largest rainfall.

In searching for an explanation of this fact, I was led to inquire into the possible sources of the bacillary infection.

From what we know of the bacteriology of acute dysentery, it is right to assume that as the bacillus escapes from the body in the stools these, as in the case of typhoid, act as the primary source of infection, and, further, that the alimentary route is probably the one by which a fresh infection takes place. The water supply of the town of Suva is beyond reproach, therefore any suspicion of its contamination by infected fæcal matter can be dismissed.

There is, in addition, no evidence that the direct infection of food-stuffs plays any part in the spread of the disease, since acute dysentery occurs amongst all races in Fiji, though their respective dietaries are entirely dissimilar. The Fijians for the most part live on cooked farinaceous foods, such as the yam and the dalo (*Calocasia esculenta*), whilst the Indian subsists, as elsewhere, on boiled rice and pulse; the Europeans on a mixed diet, in which fresh meat plays an important part.

In considering the indirect methods by which infection could be conveyed to food-stuffs suspicion fell on the house-fly (*Musca domestica*). They swarm in the bush and on the roadside, covering the traveller from head to foot. In the houses every article of food must be protected from their attentions, and it is a common occurrence during meals to place a fly-paper on the table in order to draw away the flies from the meal. In the kitchens they are specially abundant.

The abundance of flies in the cultivated districts can probably be explained by the fact that numerous favourable breeding places are afforded by heaps of decomposing sugar cane, and in the uncultivated districts by the fæcal accumulations which generally mark the proximity of native villages.

There can be little doubt that in Suva, at any rate, there is a definite seasonal variation in the number of house-flies, and that this season corresponds with the conditions most favourable for their propagation, that is the season of highest rainfall and atmospheric temperature, and it is just during these months that the maximum number of cases of acute dysentery occur.

Experiments on the transmission of the dysentery bacillus through the intestinal tract of the house-fly were undertaken at the London School of Tropical Medicine. They were conducted in a glass house in which the temperature approached that of the Tropics, reaching as high as 91° F. in the daytime. Before experiments were commenced the house was thoroughly washed out with lysol, and all stray flies and other insects were rigidly excluded. The flies were bred and hatched in captivity under as sterile conditions as possible. The pupæ were washed in dilute mercury perchloride solution (1 in 1,000) and placed in a sterile cage till the flies emerged. They were then transferred in batches of twenty in sterile test tubes to sterile bottles fitted with a gauge sleeve in the manner recommended by Graham-Smith, and fed with an emulsion of sterile bread and water introduced into the bottles by means of a sterile spoon. The flies were infected by means of bread soaked in a broth culture of the dysentery organism. Over forty experiments were conducted in this manner, but for some reason or other not all were successful.

Two strains of bacilli belonging to the non-acid and the acid or Flexner group were used for infecting the flies—that is, the true Shiga-Kruse bacillus and the Y bacillus—bacilli which, after frequent testing and subculture over a period of nine months, had given constant fermentation reactions with the sugars. The infected material, after being left in contact with the flies for twenty-four hours, was removed and sterile food was given as before.

At varying periods batches of flies were dissected, and the contents of the lower intestine were plated out in the manner described above, with the result that neither of these organisms could be recovered from the flies' intestines after the fifth day. The bacilli were recognized by the usual tests.

Lately Tebbutt, in a series of experiments in which larvæ were fed with cultures of *B. dysenteriæ*, found that the organism could only be recovered from the pupæ and imagines in a small number of cases, but concluded that the possibility of infection of flies by these organisms in their breeding grounds may be considered a very remote one.

Treatment of Acute Dysentery.

In a disease characterized by clinical forms of such varying severity, especially in native patients belonging to races differing widely in physique and disease-resisting powers, it is difficult to compare the results of various forms of treatment. In every series, however selected, there will necessarily be a number of mild cases in which the constitutional disturbances are so slight as to cause the minimum amount of inconvenience, and which, if untreated, would recover in a few days. The only reliable method would seem to be to compare the results of treatment by different methods of a parallel series of consecutive cases all approximately of equal severity.

The first fifty-three consecutive cases, of which 41 per cent. had marked constitutional symptoms, were treated by the routine treatment of the administration of sodium sulphate in drachm doses given every hour for the first twenty-four hours, and subsequently every four hours. The case mortality in this series was 13·2 per cent.

The next series consisted of 106 cases, of which 42 per cent. had marked constitutional symptoms. Some thirty-four of these were treated by salines combined with cyllin in gelatine capsules (palatinoids) in doses of twenty to thirty in the twenty-four hours (60 to 90 minims of pure cyllin); the remaining seventy-two cases received in addition to this intravenous injections of a polyvalent anti-dysenteric serum (kindly supplied by the Lister Institute). A dose of 20 c.c. was given to adults, 10 c.c. or less to children.

In apparently hopeless cases injection of 50 to 70 c.c. of this serum in the first twenty-four hours after admission was followed by remarkable improvement. After such injections no deaths occurred in a series of five cases, in whom the disease was of the severest type, as evidenced by the passage of gangrenous stools and the toxic condition of the patient.

In this series of 106 cases there were only two deaths—a mortality rate of 1·8 per cent. Neither of these deaths could be ascribed to the dysenteric lesion—one, a Fijian child, succumbed to an intercurrent attack of broncho-pneumonia; the other, an Indian woman heavily infected with ankylostomes, died in uræmic convulsions. Attention has been drawn to the occurrence of death from nephritis after massive doses of a polyvalent antidysenteric serum by Savage in his El Tor series.

In this instance not only was the average stay in hospital of cases of moderate severity considerably shortened, but it was also found that the stools resumed their normal fæcal consistency in a much shorter average space of time—that is, after five days, as compared with eight on the sodium sulphate treatment alone. These favourable results have been confirmed by Willmore and Savage working with a much more extended series of cases. The case mortality rate of dysentery in Egypt seems to have been abnormally high (70 per cent.), but under antiserum treatment in 1912 to 1913 it was reduced to 12 per cent.

The oral administration of salines and intestinal antiseptics, together with the intravenous injections of antiserum, appears to me to rest on a rational basis when the following facts are considered:—

The lesions of acute dysentery are confined to the large intestine, and from it the dysenteric toxins are absorbed; it is probably the absorption of these toxins which is responsible for the collapse so often encountered in this affection, especially in children. To counteract the deleterious effects of this toxin antiserum is injected. The administration of sodium sulphate is a necessary measure to cleanse the lower bowel of fæcal matter and thereby to accelerate the repair of the ulcerated mucous membrane. The administration of cyllin, on the other hand, in such large doses must certainly tend to inhibit the multiplication of the dysentery bacilli and other organisms in the intestinal contents.

It must be borne in mind that a very acute dysentery of primary amœbic origin, associated with the passage of gangrenous stools, in which amœbæ, though present in the intestinal lesions *post mortem*, cannot be found in the stools in any numbers during life, is also sometimes met with. In Fiji I encountered one such case. Therefore, in any given case of an apparently desperate nature, and in which there is no time to make a diagnosis by cultural methods, it is advisable to combine the specific treatment of both the amœbic and bacillary forms. If the case be not of primary amœbic origin, the hypodermic injections of emetine, if inefficacious, is completely harmless.

The combined emetine and antiserum treatment in any case of doubtful origin is therefore the most rational to adopt in the circumstances.

CLINICAL EVIDENCE OF BI-PALATINOID ORREFIN IN ANÆMIA.

Some interesting clinical details have recently come to hand from an eminent Canadian physician concerning bi-palatinoid orrefin medication. The patient, a young lady, exhibited stubborn chlorosis which had previously resisted every form of iron treatment both organic and inorganic. Bi-palatinoid orrefin with arsenic and strychnine were administered from March 2, 1913, until April 3, 1913, with the following remarkable results:—

Condition of blood	Hæmoglobin	Number of erythrocytes
March 2, 1913 ...	38 per cent. ...	2,280,000
,, 20, 1913 ...	54 ,, ...	3,300,000
April 3, 1913 ...	78 ,, ...	4,160,000

The remarkable increase in the percentage of hæmoglobin and number of erythrocytes in the blood-stream during the comparatively brief period of thirty-two days strikingly demonstrates the superior clinical efficiency of orrefin over all other forms of iron both organic and inorganic. Such is due to the patented twin construction of bi-palatinoids whereby chemical action is deterred until the immediate zone of absorption is reached, when

nascent ferrous carbonate with its inherent efficiency is produced.

The makers, Messrs. Oppenheimer, Son and Co., Ltd., London, issue various combinations of orrefin with laxatives and tonics, and will be pleased to supply practitioners with detailed literature and liberal free samples upon application to any of their agents mentioned in the advertisement of this issue.

Personal Notes.

India Office.

From January 10 to March 7, 1914.

Arrivals Reported in London.—Major W. T. McCowen, I.M.S.; Major R. M. Dalziel, I.M.S.; Major W. E. McKechnie, I.M.S.; Captain C. G. Seymour, I.M.S.; Lieutenant-Colonel C. H. Bowle-Evans, I.M.S.; Captain A. F. Hamilton, I.M.S.; Captain R. Brown, I.S.M.D.; Captain A. C. Munro, I.M.S.; Lieutenant-Colonel A. C. Yonnan, I.M.S.; Major F. L. Blenkinsop, I.M.S.; Major S. P. James, I.M.S.; Lieutenant-Colonel S. E. Prall, I.M.S.; Major W. F. Harvey, I.M.S.; Major A. Spitteler, I.M.S.; Captain H. R. B. Gibson, I.M.S.; Captain L. H. L. Mackenzie, I.M.S.; Captain F. Stevenson, I.M.S.; Captain F. S. Smith, I.M.S.

Extensions of Leave.—Lieutenant-Colonel S. H. Henderson, I.M.S., 10 d.; Major W. H. Cox, I.M.S., 6 m., M.C.; Major J. H. McDonald, I.M.S., 3 m., M.C.; Major D. McCay, I.M.S., 3 m., M.C.; Major A. Murphy, I.M.S., 4 m., M.C.; Lieutenant-Colonel G. Y. C. Hunter, I.M.S., 6 m., M.C.; Captain F. H. Salisbury, I.M.S., 3 m., M.C.; Lieutenant-Colonel R. H. Castor, I.M.S., 6 m., M.C.; Lieutenant-Colonel C. M. Moore, I.M.S., 2 m.

Permitted to Return.—Major W. D. A. Keys, I.M.S; Captain H. E. Shortt, I.M.S.; Lieutenant-Colonel L. F. Childe, I.M.S.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Bakhale, Major C. R., I.M.S., Bo., 18 m., July 10, 1913.
Bourke, Lieutenant-Colonel J. J., I.M.S., Assay Master, India, 24 m., February 3, 1913.
Campbell, Colonel R. N., I.M.S., Assam, 8 m., August 2, 1913.
Cox, Major W. H., D.S.O., I.M.S., Burma, 12 m., April 12, 1913.
Dalziel, Major R. M., I.M.S.
Elliot, Lieutenant-Colonel R. H., I.M.S., M., 13 m., April 19, 1913.
Fry, Major A. B., I.M.S., B., Sanitary Comm., 11 m. 1 d., May 18, 1913.
Gage, Major A. T., I.M.S., B. Med. Dept., Botanical Survey, 20 m., March 15, 1913.
Goil, Captain D. P., I.M.S., B., 32 m., April 5, 1913.
Hamilton, Captain A. F., I.M.S., Bo., 12 m., January 1, 1914.
Hepper, Captain E. C., I.M.S., N.P., 23 m. 26 d., April 27, 1913.
Hugo, Lieutenant-Colonel E. V., I.M.S., Punj., 14 m. 26 d., July 15, 1913.
Hunter, Captain J. B. D., I.M.S., 18 m., January 14, 1913.
Ingram, Captain A. C., I.M.S., M. Med. College, 20 m., June 30, 1913.
Jackson, Lieutenant-Colonel J., I.M.S., Bo. Prisons, 14 m., April 18, 1913.
James, Major S. P., I.M.S.
Kelsall, Captain R., I.M.S., Burma, 18 m., April 15, 1913.
Lalor, Major N. P., O.G., I.M.S., Burma Sanitary Comm., 24 m., July 23, 1913.
Leventon, Major A., I.M.S., Assam, 18 m., May 8, 1913.
Lunham, Captain J. L., I.M.S., Bo., 18 m., March 20, 1913.
McConaghy, Captain C. B., I.M.S., India Foreign, Persian Gulf, 24 m., April 4, 1913.
McDonald, Major J. H., I.M.S., Bo., 12 m., March 19, 1913.
McKechnie, Major W. E., I.M.S., U.P., 24 m., December 16 1913.
McKendrick, Major A. G., I.M.S., 24 m., February 24, 1913.
Mell, Major F. O. N., I.M.S., C. P. Gaols, 19 m., March 18, 1913.
Mitter, Lieutenant-Colonel R. K., I.M.S., M., 13 m. 15 d., August 6, 1913.
Morison, Captain J., I.M.S., Bo., 6 m., December 1, 1913.
O'Keeffe, Captain D. S. A., I.M.S., M., 15 m., August 10, 1913.
Penny, Lieutenant-Colonel J., I.M.S., Burma, 16 m., December 25, 1912.
Pereira, Lieutenant-Colonel F. C., I.M.S., M., 14 m., April 15, 1913.
Reaney, Captain M. F., I.M.S., C.P., 21 m., July 4, 1913.
Ross, Captain W. C., I.M.S., B. Med. Dept., 19 m. 21 d., April, 16, 1913.
Rost, Major E. R., I.M.S., Burma, 24 m., November 11, 1912.
Rutherford, Captain T. C., I.M.S., C.P. Med., 33 m. 18 d., March 5, 1913.
Saigol, Captain R. D., I.M.S., Burma, 24 m., February 10, 1913.
Scroggie, Captain W. R. J., I.M.S., 24 m. 14 d., May 14, 1913.
Stewart, Lieutenant-Colonel T. W., I.M.S., Burma, 24 m., December 14, 1912.
Tuke, Major A. W., I.M.S., Bo., 9 m., May 22, 1913.
Urwin, Major J. J., I.M.S., Behar and Orissa, 18 m., May 14, 1913.
Webster, Major C. G., I.M.S., M. Hospitals, 24 m., July 29, 1913.
Wilkinson, Lieutenant-Colonel E., I.M.S., Punj. Sanitary Comm., 21 m., February 13, 1913.
Wilson, Captain F. E., I.M.S., India Foreign, 24 m., May 6, 1913.
Windsor, Major F. N., I.M.S., B., 19 m. 29 d., May 9, 1913.
Wood, Lieutenant-Colonel H. S., I.M.S., B., 33 m., February 18, 1913.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Blenkinsop, Major F. L., I.M.S., to July 27, 1914.
Bowle-Evans, Lieutenant-Colonel C. H., I.M.S., to December 31, 1914.
Brown, Captain R., I.S.M.D., to July 8, 1914.
Burke, Captain G. T., I.M.S., to October 26, 1914.
Coullie, Captain A. G., I.M.S., 1 y., to August 3, 1914.
Cruddas, Major H. M., I.M.S., to March 31, 1914.
Davidson, Lieutenant-Colonel J., D.S.O., I.M.S., to July 7, 1914.
Durham, Lieutenant W. R., I.S.M.D., to April 30, 1914.
Fox, Lieutenant E. C. R., I.S.M.D.
Gibbs, Major A. A., I.M.S., to April 30, 1914.
Gibson, Captain H. R. B., I.M.S.
Haughton, Captain S., I.M.S., to March 5, 1914.
Horne, Captain J. H., I.M.S.
Inman, Captain H. M., I.M.S., to February 17, 1914.
Jolly, Captain G. G., I.M.S., to May 8, 1914.
Kennedy, Captain R. S., I.M.S.
Ker, Lieutenant-Colonel M. A., I.M.S., to March 19, 1914.
Mackenzie, Major H. M., I.M.S., to October 31, 1914.
Mackenzie, Captain L. H. L., I.M.S., to February 2, 1915.
McCowen, Major W. T., I.M.S.
Mehta, Captain S. B., I.M.S,
Mills, Captain P. S., I.M.S., to September 10, 1914.
Moore, Lieutenant-Colonel C. M., I.M.S., to April 3, 1914.
Munro, Captain A. C., I.M.S., to January 12, 1915.
Murphy, Major A., I.M.S., to July 18, 1914.
Ozzard, Lieutenant-Colonel F. R., I.M.S., to May 9, 1914.
Prall, Lieutenant-Colonel S. E., I.M.S.
Seymour, Captain C. G., I.M.S., to December 16, 1914.
Shortt, Captain, H. E., I.M.S., to April 9, 1914.
Smith, Captain F. F. S., I.M.S.
Spitteler, Major A., I.M.S., to February 3, 1915.
Stevenson, Captain F., I.M.S.
Watson, Major C. H., I.M.S., to May 6, 1914.
Yonnan, Lieutenant-Colonel A. C., I.M.S., to December 13, 1914.

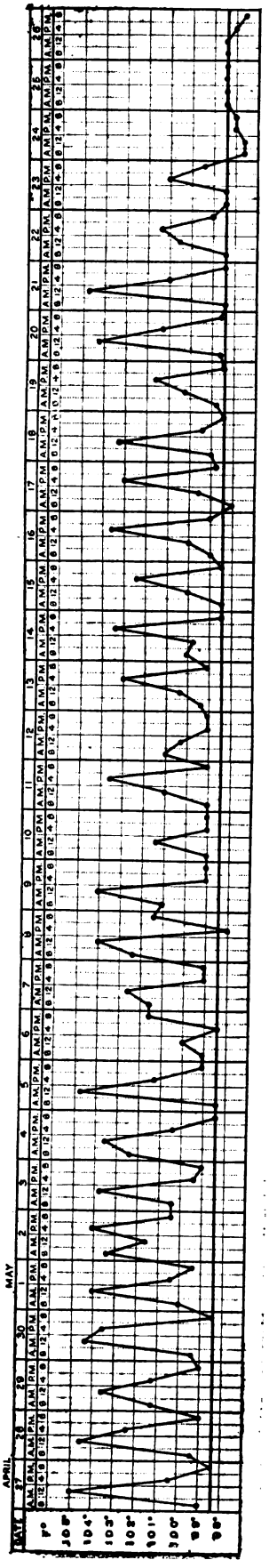


FIG. 1.

Original Communication.

NOTE ON CERTAIN PROTOZOA-LIKE BODIES IN A CASE OF PROTRACTED FEVER WITH SPLENOMEGALY.

By ALDO CASTELLANI, M.D.

Director, Clinic for Tropical Diseases, Colombo, Ceylon.

AT a meeting of the Ceylon Branch of the British Medical Association, held in Colombo on May 31, 1913, I read a preliminary note on some peculiar bodies found in the spleen of a case of splenomegaly with fever of long standing, terminating fatally. It may perhaps be of interest to give here a few more details on the case and the bodies found.

The patient, Andreas, was a Sinhalese boy, aged 14. He was admitted to Dr. Grenier's Ward, General Hospital, on March 30, 1913, with history of fever of several years' duration. According to his relations the boy, when aged 3, had several attacks of malaria which yielded easily to treatment. The present fever started (always according to the parents) when the boy was aged 9, and not having yielded to native and European treatment, the boy was brought to the General Hospital, Colombo.

The fever, while the patient was in hospital, was generally intermittent and did not respond to quinine given in massive doses by the mouth and by intramuscular injections. The boy was transferred, by kind permission of Dr. Grenier, to the clinic on April 18. The fever continued of the same type, namely, intermittent, and the maximum temperature varied from 103° to 105° F. The attacks of fever did not start with shiverings and defervescence was not accompanied by sweatings. The spleen was much enlarged and hard, the liver slightly enlarged, neither organ was tender on pressure. All other organs were normal. No enlargement of the lymphatic glands. The patient became emaciated towards the end of the disease.

Examination of the Blood.—Three counts were taken; the average was: the red blood corpuscles were reduced to 220,000, leucocytes 5,200, hæmoglobin (Fleish) 30. A few nucleated red cells were present, basophilia and chromatophilia both very marked. Serum reactions for Malta fever, typhoid, paratyphoid, always negative. Laveran's parasites always absent. No pigment. On two occasions peculiar bodies—to be described later—were found.

Leucocytic Differential Count.—Polymorphonuclears, 50 per cent.; lymphocytes, 40 per cent.; large mononuclears, 7 per cent.; eosinophiles, 3 per cent.

Urine.—Nothing abnormal was noted, except occasionally a faint trace of albumin.

Course and Treatment.—Quinine was continued in massive doses (30 gr. and 40 gr. daily) by the mouth and intramuscularly without any effect. The general condition of the patient became gradually worse and the boy became greatly emaciated. Death took place on May 26. Three days before death the temperature fell to normal.

Post-mortem.—The *post-mortem* examination was held three hours after death. Body greatly emaciated, all the organs of normal appearance except the spleen, which was greatly enlarged, smooth, not very hard, not slate-coloured; the cut surface was of reddish colour. The examination of many films revealed absence of any malaria parasites, but a few granules of a rather light yellowish pigment were present. The presence of these rare granules of pigment does not make me consider that the case was one of malaria; the presence of a few granules of pigment is found practically at the *post-mortem* of nearly every child in Ceylon, whatever the disease causing the death; the boy, like most children in Ceylon, had merely suffered from malaria when very young, as stated by his parents.

DESCRIPTION OF THE BODIES FOUND.

Bodies found in the Blood.—These are extremely rare. They are roundish or pear-shaped, with a maximum diameter of 7 to 12 microns, most of them are vacuolated. The protoplasm by Giemsa stains a pale blue and several large masses of chromatin are present. These bodies, for

convenience sake, I will indicate as bodies of Type 1. One such body is depicted in the coloured plate A.

Bodies found in the Spleen.—Two types are found; some, of extreme rarity, are identical to those found in the blood (Type 1); others, the enormous majority, are different. The latter, which for convenience sake I will term bodies of Type 2, are roundish, oval, or crescentic bodies, 2½ to 6 microns in maximum diameter, with protoplasm staining blue, and generally one large roundish mass of chromatin at one pole or in the middle. In one instance the faintest appearance of a flagellum seemed to be present. Occasionally the bodies are larger, roundish or pear-shaped, and have two chromatin masses, one at each pole or close together. The bodies are generally free; only in one specimen did I find some contained in a leucocyte. Those which have two chromatin masses have quite a different appearance from the Leishman's bodies, being larger and more spherical, and give the impression of being either parasites preparing for division, or fusion forms.

Nature of the Bodies found.—The bodies of the type present in the blood (Type 1) do not seem to be merely degenerated basophile cells with nuclear remnants; in such degenerated erythrocytes the dots staining red are, in my experience, generally small, much more scattered, and when stained by Giemsa they are generally of a peculiar red—lighter and less purplish than true chromatin. The bodies have none of the appearance of any kind of leucocytes or of blood platelets. I was inclined at first to consider them to be related to Koch's bodies, or "*Plasma kugeln.*" These, as well known, are roundish, oval, or somewhat irregularly shaped cells, 8 to 12 microns in diameter, found by Koch in Africa in cattle affected with East Coast fever. Koch's bodies have recently been put in connection, by Gonder, with piroplasmata; in fact, this author believes them to represent a stage in the life-cycle of *Theileria parva*. Against the hypothesis that the bodies of Type 1 are *Plasma kugeln* would be the fact, in my case, that they were found in the blood and were practically absent in the spleen, and the chromatin masses contained in the bodies were much larger than those found in typical Koch "blue bodies." As regards the bodies found in the spleen (or bodies of Type 2), even on superficial examination they cannot be confused with nucleated basophile red cells nor with varieties of *Leishmanias*. There is no doubt, it seems to me, that morphologically, as I stated in my previous papers,* they closely resemble toxoplasmata, but for the fact that very rarely, only on one occasion, they were intraleucocytic. Further investigation is necessary to see whether the bodies of Type 1 I found in the blood are connected with those of Type 2 found in the spleen, and which I am inclined to believe to be related to toxoplasmata, in some similar manner as Koch's *Plasma kugeln* are connected with theilerias.

I may add that I have shown the bodies found in the spleen to several medical men and zoologists, among whom Professor Plate, of the University of Jena; Major James, I.M.S.; Major Harvey, Director of the Kasauli Research Institute; Dr. Georgina Sweet, Lecturer on Protozoology at the University of Melbourne; Major Gaudicheau, and several others. They all agree that the bodies are parasitic and of protozoal origin, but greatly differ as regards their classification. Major Gaudicheau considers them to be toxoplasmata, and Major James is inclined to come to the same conclusion. Professor Plate suggests that these bodies may represent a developmental stage of a coccidium; others place the bodies in a new genus closely allied to the genus *Leishmania;* several colleagues are of opinion that they are piroplasmata, while others consider them to be anaplasmata; and the opinion has also been expressed that it may have been a case of mixed infection, piroplasma or anaplasma and toxoplasma.

Personally I am still inclined to consider the bodies found in the spleen to be toxoplasmata, though I quite admit that the appearance of some of them give the impression of their being anaplasmata or piroplasmata which have infected basophile red cells.

* I suggested the term toxoplasma pyrogenes (May, 1913).

Annotation.

Ringworm Yaws (H. C. Clark, *Journal of Cutaneous Diseases*, January, 1914).—The case described and illustrated is that of a male negro, aged 23, who had been resident for three years at Panama. An eruption on his trunk and limbs had been diagnosed and treated as *Tinea circinata*. Failing to respond to treatment, the patient was admitted to hospital. The lesions had elevated, indurated borders and increased pigmentation, with central, dry, yellowish-white exudate, suggesting a mycrotic growth. Smears showed large numbers of *Treponema pertenuis*. The Wassermann test was positive, as it was in nine out of eleven other cases of yaws. References are given to other pictures (Howard Fox, *Journ. Cutan. Dis.*, February, 1908; *Arch. f. Dermat. u. Syph.*, 1912, cxiii, 315; *Journ. Amer. Med. Assoc.*, May 10, 1913; Castellani and Chambers' "Manual," p. 866).

COCOA AND KERNELS.

From being tenth on the list of cocoa-producing countries in 1903, the Gold Coast attained the leading position in 1911, and retained this in 1913. The latest figures available, show an export of 39,200 tons, valued at £2,484,218. It is a triumph of Imperial tropical agriculture that over one-third of the world's product of cocoa is produced under the British flag. The industrious Nigerian natives, to have exported 184,625 tons of kernels in 1912, must have cracked 190,237 million single nuts, not far short of 200,000 millions, and each nut cracked singly between two stones.

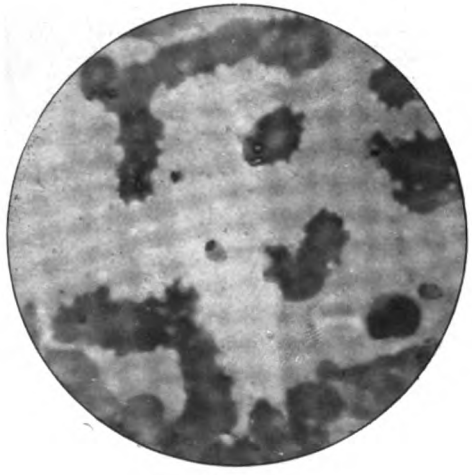


FIG. 2.

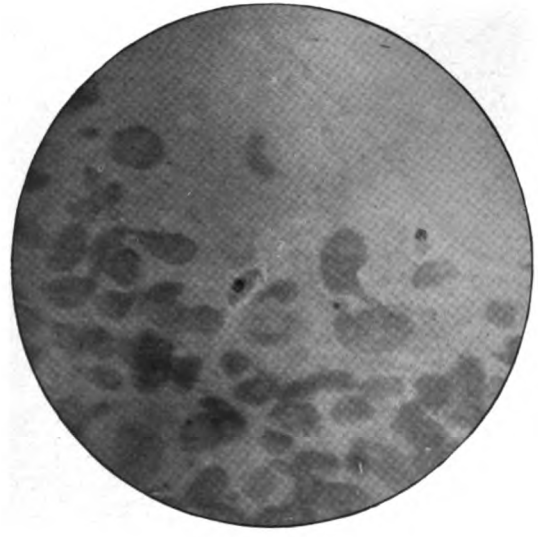


FIG. 3.

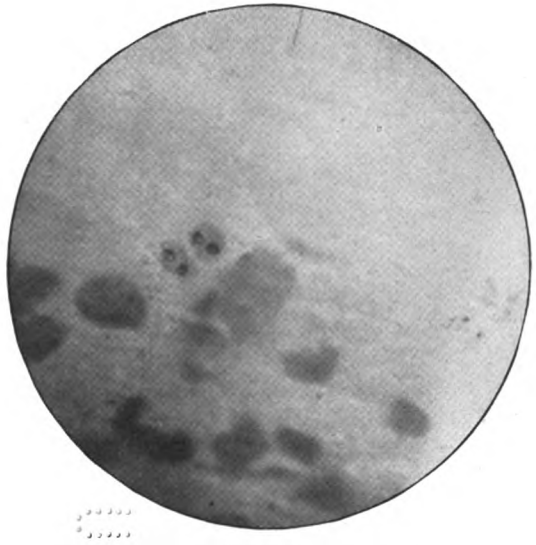


FIG. 4.

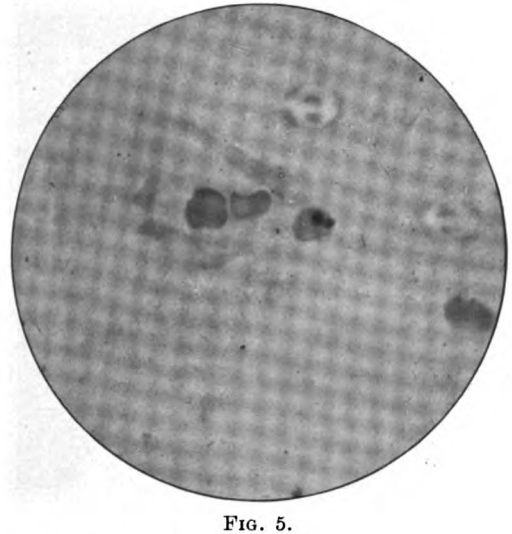


FIG. 5.

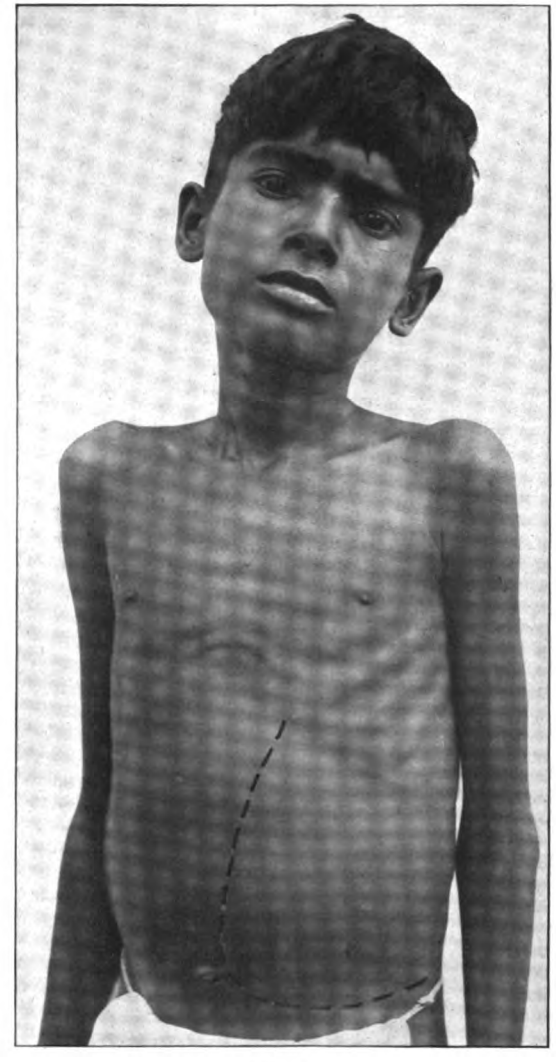
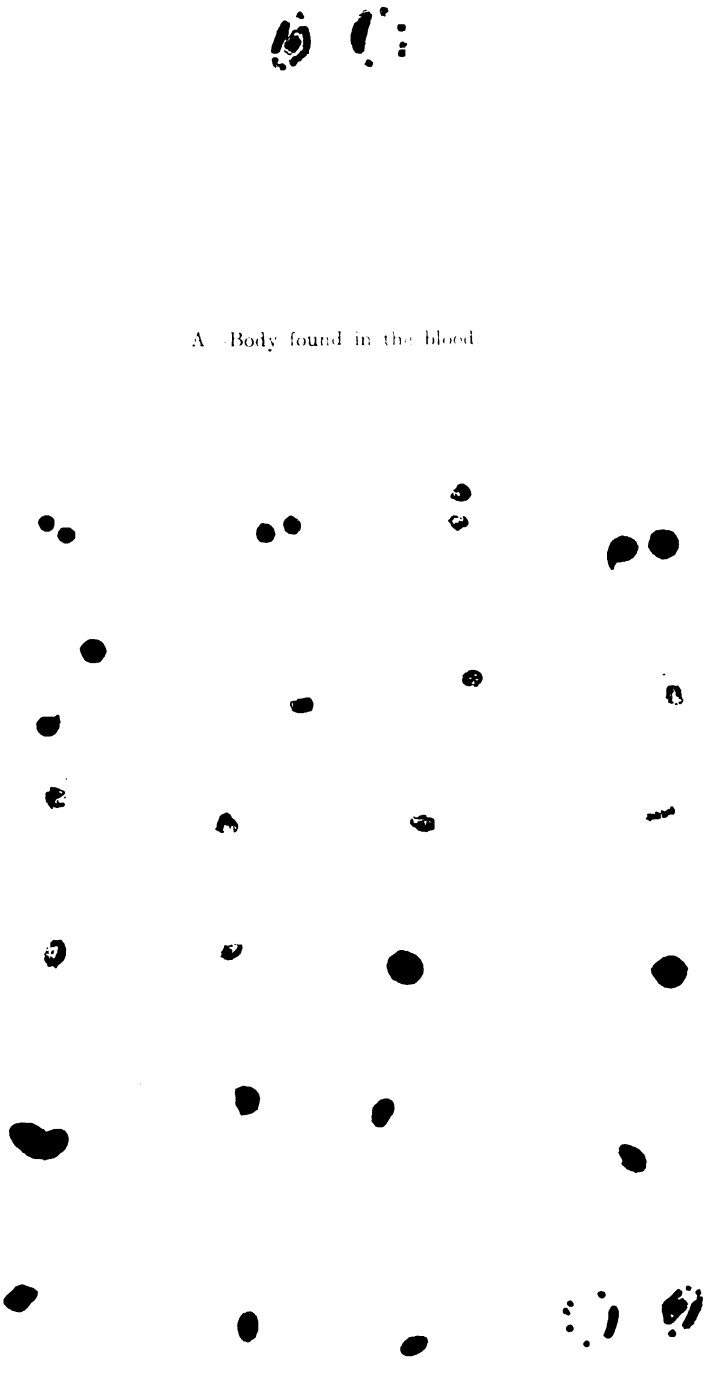


FIG. 6.

Figs. 2, 3, 4, 5.—Photomicrographs of Bodies found in the Spleen.

To illustrate article, "Note on certain Protozoa-like Bodies in a Case of Protracted Fever with Splenomegaly, by ALDO CASTELLANI, M.D.





A.—Body found in the blood.

B.—Bodies found in the spleen.

To illustrate paper by ALDO CASTELLANI, M.D.,
"Note on Certain Protozoa-like Bodies in a Case of Protracted Fever with Splenomegaly."

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 15, 1914.

SCIENTIFIC ANNOUNCEMENTS IN THE LAY PRESS.

THE lay press in Britain has lately taken notice of "things medical" to an extent hitherto unknown. During the past twelve months, especially, nothing is more noticeable than the seeming importance to the journalist of all that appertains to medicine. The development of this phase of journalism may have its good points, but it is a feature of modern medical life which is new to us as a profession. The reason for the seemingly sudden interest taken by the daily newspapers in this field of work it is difficult to gauge, for it may be due not to any one cause, but to a number of circumstances. Without discussing the oft-repeated legend that, at modern dinner parties and afternoon teas, the subject of the operations performed upon those present or their friends is for ever uppermost, and a wealth of detail given of how much was removed, what was left, and what it cost, there is a better side to this publicity which is not regrettable.

When the history of medicine during the past quarter of a century comes to be written, the one outstanding feature of the period will be shown to be "the part played by insects in the spread of disease," and the application of this knowledge as a practical hygienic factor. Vermin have been "detested, shunned by saint and sinner," since the creation of man, but the reason for the abhorrence has only been proved of late years. That the mosquito can carry malaria, yellow fever, and filaria; and that the bed bug, the louse, the flea, the fly, the blackbeetle, the tick, the itch insect, and other vermin are agents in the transmission of a given disease is now common knowledge. This information has placed the subject of domestic and public hygiene and sanitary endeavour on a sure foundation, and given a stability to preventive measures hitherto unattainable. It is one thing to recommend a measure which it is believed to be "good for" the individual or the community, and quite another thing to advocate and enforce laws which are known to be essential to the personal and public safety and welfare.

Important as the health of the people is—and it ought to be the first consideration—the fact that the knowledge obtained has become of high commercial value appeals very directly to business men and to statesmen. The fact that the health not only of the Europeans engaged in commercial and other pursuits in tropical and sub-tropical countries has a direct bearing upon the financial aspects of the concern, but that the freedom from disease of each individual native or coolie labourer on the tea or rubber plantation is an apparent and an important factor when drawing up the yearly balance sheet, has caused business men to listen to the teaching of science to a degree wholly impossible a few years ago. Hampered by hesitation whilst yet empiricism reigned, the doctor had difficulty in getting business men to listen to his advice as regards sanitary affairs; but now that cause and effect can be definitely demonstrated, when the consequence of the neglect of following the principles laid down can be shown and balanced on opposite sides of the day-book and ledger, the doctor can speak with the conviction accruing from actual knowledge, and his recommendations can no longer be brushed aside as mere fads or opinions, but as definite laws founded on facts which admit of no discussion.

Politically, as well as commercially, the work of Gorgas and his colleagues on the Panama Canal brings home to statesmen the meaning and importance of modern knowledge in regard to the spread of disease and the practical application of the lessons learned therefrom. That this is the real reason for the public notice now taken of medical matters

there is little doubt; and that the spread of this knowledge is wise is incontestable. There is, however, a tendency to "journalize" medical science in a way which is questionable. Any announcement, be it a new drug, a newly devised operation, a suggested hygienic measure, or some one of the many laboratory experiments now in vogue, is taken up as a matter of journalism very often to the detriment of the scientific worker, who finds his discovery publicly announced whilst yet it is but in the stage of development or experimentation. There is a great difference between the journalism of the newspaper and that which obtains in medical journals. Newspaper journalism means publication *at once;* delay until to-morrow might mean that other papers might become acquainted with the matter, and anticipate the "exclusive" information which is to hand. The substance of the information may perhaps be supervised by a medical man on the staff; but the hurry to publish may not admit of this, or the medical man consulted may not be familiar with the expert matter being dealt with, for no one nowadays is competent to advise in every branch of medical science. We know that the "newspaper men" despise medical journalism; they declare that "were we to conduct our paper on the lines of the medical journal we would not exist a week." They then proceed to advise how the doctors ought to conduct their journals and how to be up to date. It is to be hoped that this desire for "copy" will never permeate medical publications. Art is long, and science cannot be hurried in its findings; the ephemeral cures and discoveries in the past are many, and the scrap heaps of blunders cumber the field. If our newspapers are to announce the efforts of research in medicine, we would beg of them not to make too great haste to obtain unfinished "exclusive" copy, but to consider scientific medicine as a thing apart and as one requiring special handling.

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General Article.

THE STORY OF SOME OF OUR COMMON DRUGS.

I.—CAMPHOR.

THAN camphor no other drug in the pharmacopœia is obtained with so great difficulty, danger, and bloodshed. The chief source of our supply is Formosa, and the history of the island is one continuous fight to defend the camphor trees from invading forces. Many nationalities have attempted to subdue them, including Dutch, Portuguese, Spanish, Chinese, and, lastly, Japanese, and even the British have in the course of the last two centuries had cause to repent approaching Formosan shores.

One little thinks that a vegetable product could be so troublesome to obtain, and when the fact of the great annual sacrifice of life—amounting to hundreds in the course of the year—is brought home to us we are apt to wonder if camphor really is so precious as to justify the expenditure?

In our student days we cannot remember that our teachers laid great stress on the uses of camphor, and to our everyday thoughts the value of the drug is rather of an indefinite quantity. The fact is that camphor has no specific effect upon any one of our specific ailments; it is used now as a carminative, now as a liniment, as a general stimulant to the cardiac, respiratory, and nerve centres, or as an insecticide for domestic use in our wardrobes.

Like our daily food, procured from the butcher, the baker, and the grocer, we give no thought to its source or the difficulties attending its transference from its source to our tables; so we get our drug from the chemist without a thought as to how it reached its labelled bottle or its hypodermic tube. It may be truly said of camphor, as it is of the "caller herring," "wives and mothers, maist despairin', call them lives of men," for camphor is bloodstained to a degree, and it is said that every particle of camphor costs its quota of blood. The present great source of camphor is Formosa; not so long ago Japan supplied us with a good deal of our camphor, but the camphor trees of Southern Japan, imported no doubt at one time from Formosa, have to a great extent been destroyed, owing to the regulation, at one time in force, that no tree should be cut unless another were planted, having been neglected. It is to Formosa then that all eyes are turned for our supply of camphor, and the difficulty of reaching the area of supply entails so much danger and expense that the natural product is apt to be neglected for the artificial or synthetic. It has been known for many a year that the Chinese run great risks in obtaining the crude camphor, but it was thought when the Japanese took over the island from the Chinese after the China-Japanese war, in the 'nineties of the last century, that the difficulties of obtaining the drug were over, and that natural camphor would flood the markets. This, however, has not proved to be the case, and for the following reasons: The camphor tree (*Cinnamomum camphora*),

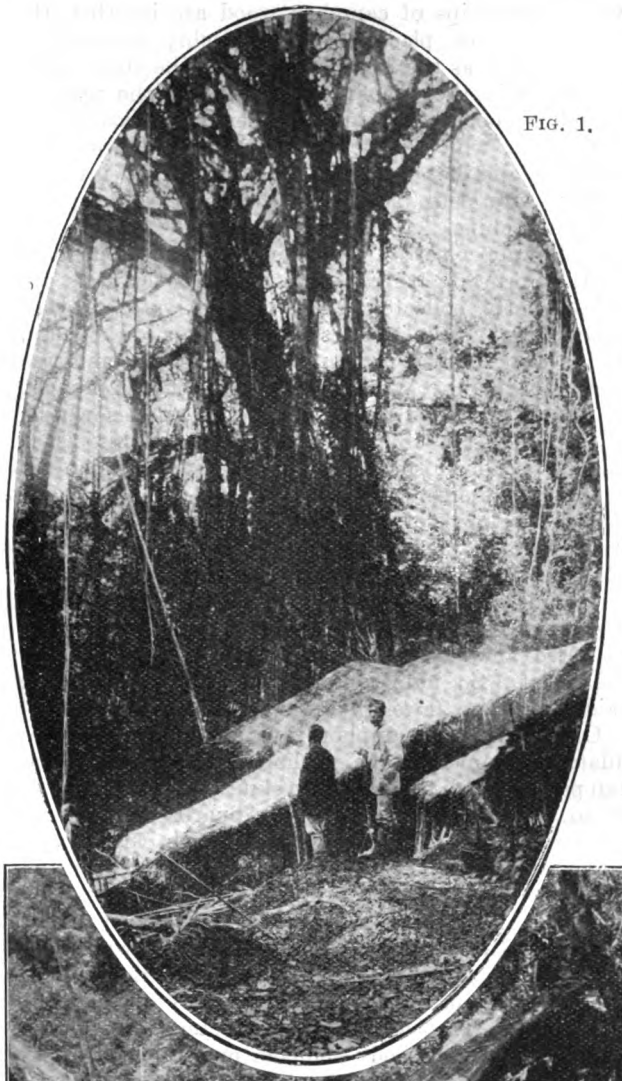


FIG. 1.

or, as it used to be called, the *camphora officinarum*, belongs to the laurel group of plants (nat. ord. *Lauraceæ*). It grows in Formosa, but unfortunately it is found only in the mountainous districts of the interior of the island, occupied by tribes of savages, who, quite aware of the value of their possession, carefully guard the virgin forests in which the camphor trees thrive. The savages are fierce and are said to be "addicted to head hunting," a pastime which has cost many lives through several centuries, and even to-day renders attempts to seize the forests by the Japanese anything but an easy task, for head hunting is a religion with the native savage. The penetration of the country occupied by the savages is well nigh impossible, so long as armed opposition is in force, for the area is mountainous to a degree, reaching in height in some places to some 8,000 ft.; the valleys are covered with tall grass in which various plants intertwine, forming a dense jungle.

The loss of life of late years has been high, but in as recent a period as 1905 and 1906 no fewer than 600 camphor workers were killed, as well as 150 lumbermen and labourers. Treachery and bush-fighting combine to form the obtaining of camphor a dangerous task, and one which can only be carried on by high pay to those engaging in it. Camphor is expensive, and no wonder. The elaborate military organization of the Japanese in their endeavour to keep the savages in check and to gradually narrow the limits of their territory, consists of making a path, 6 ft. wide, around the area which passes through forests and over the high mountains. At every 120 yards there is a guard-house, and every fourth or fifth guard-house is constructed as a minor fort, capable of resisting attack and protected by wire entanglements and entrenchments; the houses are in telephonic communication with each other, and at certain strategic points mountain and field guns have been set up. The gradual advancement of the line neces-



FIG. 2.

[*By permission of the proprietors of "The Wide World Magazine," from an article by Mr. F. O. Koch.*]

FIG. 1.—A primitive Formosan camphor still in the heart of the head-hunting country.
FIG. 2.—A camphor distillery near the east coast of Formosa.

sitates other sets of stations and forts, bringing forward guns, &c.; and as since 1903 this line has been pushed forward on 70 different occasions, the enormity of the work can be, to a certain extent, understood. And all for what?—To obtain camphor.

The island is nearly as big as Scotland, and one-half its area is in the possession of the savages, and to rout them from their stronghold is a work of time. The Japanese are proceeding upon a systematic plan of campaign. A guard line has been drawn all along the mountainous district, with small military outposts at regular intervals in order to protect the camphor gatherers, and the danger attending the task may be understood when it is stated that during 1912 as many as 187 gatherers were killed and 190 wounded. It is computed that there are about 1,000,000 camphor trees in the country, and to meet the demands of the world's camphor market as many as 10,000 trees have to be cut down annually. So that without any afforestation precautions there are sufficient trees in Formosa to supply the demand for the next hundred years. With careful afforestation, such as the Japanese are sure to introduce, the supply of camphor will become practically inexhaustible. The world's supply at present is met by about 3,000,000 lb. of camphor and some 2,000,000 lb. weight of camphor oil.

Formosa supplies these amounts now, and with greater facilities for collection the quantities could be increased if necessary. The value of the camphor industry to Japan is considerable, but it cannot be got complete control of until the savages have been either subdued or exterminated. The number of the savages is estimated at only 120,000, yet with all their disparity in population Japan had to vote £1,000,000 sterling to conduct operations against them and to send a large number of troops to the island. It is not likely we shall see a fall in the price of camphor until the campaign against the savages, which, it is estimated, will last about another twelve years, is terminated.

The method of procedure at present followed in preparing the camphor is as follows: The trees are felled, then chopped into chips, and it is by the distillation of these chips that the crude camphor is obtained. It is plain, therefore, that as the trees are cut down, unless replanting is practised, the supply in time dwindles, although as seen above, this may be delayed for a long period. Camphor in Formosa is not obtained as it is in Borneo and Sumatra, where in the clefts of the *Dryobalanops camphora* it is obtained in its concrete form, and therefore the initial expense of distillation is not necessary, for Nature has performed the process, and produces the concrete camphor ready to hand. The process of distillation adopted by the natives was described in 1869 by Mr. E. C. Taintor, in a trade report of the district of Tamsai, a town in the northern part of the island. The method is somewhat as follows: A wooden trough, dug out from a tree trunk, is lined with a coating of clay. Into the trough is poured a quantity of water, the hollow of the trunk is covered by a board perforated by a number of holes into which the chips of camphor wood are inserted, the trough is now placed over a roughly constructed furnace, and as the heat is generated the steam from the water in the trough passes through the piece of camphor wood placed in the holes in the board, and the steam which issues is impregnated with the camphor distillate, which is received in inverted earthenware pots placed for that purpose over the holes and chips.

In the upper part of the pots the steam condenses in the form of whitish crystals. The crystals are subsequently collected and stored in vats to await exportation. Whilst in store camphor oil exudes, and is sold for use in many directions in commerce and in medicine. When the crude camphor is brought to the towns on the coast or to Japan and elsewhere, it is refined by sublimation, and collected into glass jars of peculiar form, to the upper part of which the sublimate adheres.

The pictures of camphor distilling printed by permission of the proprietors of the *Wide World Magazine*, shows the crude process of distillation in its primitive form. The vapour when condensed is deposited as crystals on bamboo screens, whence it is gathered and sent to the factories in the towns on the coast. So numerous are these that there are said to be no fewer than 8,000 stills in the island.

Of the uses of camphor it is unnecessary here to dilate. Camphor is one of the few substances which can pass through the unbroken skin, hence its presence in so many of the liniments ordinarily prescribed; similarly camphor is absorbed through the mucus membrane, and it reaches the blood unchanged by either route. Camphor is not known to be a specific for any ailment, but it acts on almost every organ and system of the body: the circulation, the respiration, the digestion and the nervous system are each and all affected by its use. In febrile states it is much sought after in the Tropics, for it is a potent diaphoretic and it lowers the body temperature in pyrexia; its aphrodisiac action enhances its value in men's minds, especially in tropical countries where the sexual powers for various reasons are wont early to flag.

As a prophylactic against infectious illnesses, as a moth and insect destroyer, in the preservation of furs, skins, &c., of naturalist specimens, and for a host of domestic and medicinal purposes, camphor is in use, and will continue to be used. Yet is the acquisition of this article of common use bought with more expenditure of blood than any other known substance; and whilst the housewife places her campholine balls amongst her winter clothing when summer approaches, or the doctor prescribes tinc. camph. co. in his expectorant mixture, or includes camphor in his liniments, they little think that this vegetable product is only obtainable at great sacrifice of life, and that the popular saying that every particle of camphor costs its weight in blood has some justification.

J. C.

Abstracts.

MINERS' PHTHISIS ON THE RAND.*

By J. L. Aymard.

Though water may be freely used in the form of a spray from the moment the drill hits the rock to the end of a 4-ft. or longer hole, there is a time when it does not effectually destroy the finest dust. This period is when the drill is hammering and chipping away at the rough uneven surface of the rock in order to gain a start for the hole. This process is termed "collaring the hole." More frequently than not no water is used during this process, which provides abundance of the deadly dust. Another dufficulty to be faced is the constant breaking down of water-supplies; these for the most part are avoidable and due to too great pressure, corroding of unprotected pipes, &c. Almost all these difficulties could be overcome. The continuous forced passage of dust-laden air through places where men are working can be of little advantage, if any. The dust must be rendered harmless as much as possible at its point of origin. If the fine dust is entirely produced by blasting, then it should be all carried out of the mine before the men re-enter to work. The fact remains that sufficient of the really fine fatal dust (irrespective of blasting) is produced by the rock drills to account for the whole of the silicosis on the Rand. Before the strike the miners, through their union, endeavoured to limit the number of machines each man should supervise; upon the whole they were fairly successful. To-day there is no limit, and no limit means no control as regards the keeping down of dust produced by rock drills. If the mining houses and the Government (which are practically one) were honestly sincere in their efforts to stop this curse, they would surely insist on the efficient control of every drill. This by no means implies that one miner is necessary for every drill when one or more are placed together, but, with few exceptions, one miner only can supervise one drill properly when working any distance up a raise. The production of the finest dust from a rock drill means, when circulating as it freely does, the death element to everyone working in the mine.

Miners' phthisis was well known not many years ago in ganister mines near Sheffield. It has now practically ceased. The Home Government insisted upon the fine dust produced in ganister mines in England being kept down by the use of steam, when miners' phthisis ceased.

The fact that steam has eradicated miners' phthisis in the ganister mines points to the fact that in order to attract the very finest and most deadly dust the water must be in a much finer state of division, and this can only be produced by steam. Steam therefore appears to be not only the only hope, but by experience elsewhere the only sensible solution left. Steam could be introduced after the cessation of drilling through the compressed air pipes. The question at what depth this would be impracticable, if at all, remains to be seen. Anyhow, it would only seem common sense to gradually work down from level to level. Something more must be done to prevent this awful waste of life, and that at once.

* From the *Lancet*, April 11, 1914.

THE MORTALITY ON THE RAND: SOME OF ITS CAUSES.†

By B. G. Brock, L.R.C.P. & S.Edin., D.P.H.

The diseases chiefly responsible for the abnormal mortality are pneumonia and tuberculosis; the following remarks therefore apply more especially to these. It has been shown that 80 per cent. of the natives coming to work on these fields suffer from a constitutional "taint" which renders them peculiarly susceptible to contract both pneumonia and tuberculosis in a virulent form.

Altitude.

In the case of natives coming from the coast or other place of low altitude to the Rand great changes occur in the blood. The normal number of red cells per cubic millimetre at sea-level is roughly 5,000,000, while on the Rand, 6,000 ft. above sea-level, it is from 7,000,000 to 7,500,000. It takes from fourteen to twenty days after arrival on the Rand for the blood to reach this standard. During this time the oxygen-carrying capacity of the blood must be below normal, and the tissues, receiving an insufficient supply, must be thereby reduced in disease-resisting power.

These facts would appear to supply the explanation of the oft-repeated observation that "boys" are much more liable to contract pneumonia and tubercle during the first two or three weeks of their stay on the Rand than later. Some hold that the greatest number of cases of sickness occurs in the first twenty-four hours, but the fact that the mass of native workers come off a long and tiresome journey, without the opportunity of getting any rest, and are drafted at once to their various destinations, along the "Reef," suggests that many of these "first twenty-four hour" cases are probably due to simple exhaustion. It has further been found that there is a direct proportional relation between the amount of hæmoglobin and the amount of immune substances in the blood. It seems therefore probable that if special care were taken of the "boys" during the transitional period it might materially aid in reducing the sickness-rate and increase the chances of escaping pneumonic and tuberculous infection. What amount of injury results to the blood, if any, from the men spending half the day at an altitude of 6,000 ft. and the other half at from 1,000 to 3,000 ft. there are no data to indicate.

† From the *Lancet*, April 11, 1914.

Conditions of Living on a Mine.

The standard native ration is: 20 oz. mealie meal, 8 oz. wheat bread, and 4 oz. beans (dried) per day; 3 lb. "meat," 22 oz. pea nuts, 16 oz. treacle, and 40 oz. vegetables per week. This ration is added to in some of the mines. There seems to be a good deal of difference of opinion as to the suitability of this ration. It is a ration built entirely on its calorie value, it is not a toothsome diet, there is a considerable waste in unconsumed food, and there is a considerable amount that is not digested or assimilated, while the manner of cooking may influence the value of a diet. The compilation of an *efficient* diet is undoubtedly difficult and can only be attained by direct experiment. A "boy's" clothing usually consists of a blanket—often a mere rag—a pair of trousers, and a shirt. His bed—plain wooden boards without bedding. The "compound" room in which he eats and sleeps is a large draughty barn, under-heated and over-ventilated, always dusty, often dirty and verminous. Comfort there cannot be, and under the conditions warmth and restful sleep are well-nigh impossible. Add to this that the native is extremely sensitive to cold, and that in winter there may be as much as 20° F. between the wet and dry bulb thermometers, and the least imaginative will realize that the most robust constitution is liable to break down under such treatment. How are those who are constitutionally susceptible to pneumonia and tuberculosis to pass through such an ordeal unscathed? They cannot and do not. These are the places where, and the conditions under which, pneumonia and tuberculosis spread, flourish, and destroy.

Is it lack of knowledge, simple thoughtlessness and lack of sympathy, or downright callousness that permits such conditions to exist? Probably some of each. The "great expense" has been a reason against any change. But when the problem is examined carefully one cannot help thinking that all the necessary changes would not only not raise the "working costs" of a mine, but would prove to be an investment that would return a handsome dividend.

Working Conditions.

Little need be said on these. Dust, carbonic oxide, and nitrous fumes should, of course, be reduced to a minimum by improved ventilation and increased care; but no matter how stringent regulations may be, in the nature of things they will still exist in all the mines to some extent, and the two latter probably continue to do some harm, the carbonic oxide by putting some hæmoglobin "out of action," and the fumes by causing some bronchitis, thereby lowering the resisting power against bacterial attacks locally and generally.

The dust that might remain in a well-ventilated mine would be of little account. Oliver, in his "Diseases of Occupations," p. 293, gives an excellent illustration of this. He quotes from a report by Dr. Brembridge on the Kolar gold mines to the following effect:—

"On the Kolar gold mines in India there are 40,000 coolies employed; the rock is hard. Yet there is no evidence of miners' phthisis, except in men who came from the Transvaal. Although no precautions are taken in the Kolar mines to throw water on the surface to diminish the dust after the use of explosives, and the men work hard, the miners, native and white men, keep good health. There is plenty of dust in the Kolar mines; it is hard quartz rock that is blasted, and without such precautions as the spraying of water. A large percentage of miners die from pneumonia, due not so much to the dust as to the fact that the men, after working hard for eight hours, are obliged to climb ladders to a height of 2,000 ft. in a state of fatigue and when perspiring, and thus become chilled. The proof that this has had much to do with the prevalence of pneumonia has been demonstrated by the fact that since a skip, whereby the coolies can ride to the surface, has been introduced into one of the mines from which the largest number of cases of pneumonia came, the number of cases of acute lung disease has considerably diminished."

Here, too, this cause of pneumonia to some extent exists, but here the "boys" come from the warm moist mine into an exceedingly dry and cold air—indeed, it may be compared to putting them into a freezing chamber.

The "rates" for Germiston district help to bring out the importance of the above remarks. In the following table the incidence rate for pneumonia and the death-rate for phthisis (tuberculosis and miners' phthisis) for three years are given for three races then working on the mines. Underground they all worked under the same conditions and were exposed to the same dangers, save that the native was less well protected against chills on coming to the surface than were the other two races.

	Whites			Natives			Chinese		
	1905-06	1906-07	1907-08	1905-06	1906-07	1907-08	1905-06	1906-07	1907-08
Pneumonia incidence per 1,000	2·30	2·54	3·44	28 04	29·37	45·07*	2·05	1·37	1·96
Phthisis deaths per 1,000 (tuberculosis and miner's phthisis)	2·28	2·45	1·23	4·94	3·67	3·63	1·58	0·87	1·71

* The importation of natives from the Tropics caused the very great increase in the rate for this year. For all the three years a good many cases of tuberculosis in natives came under this head.

These figures show that the natives suffered more than the other races. In the case of whites and natives the figures for "phthisis" are very much below what actually existed on account of the whites going and the natives being sent out of the district when they became unfit for mine work. Nevertheless, the Chinese, although the full rates are recorded, show lower figures than black or white. The Chinese occupied the same compounds

as the natives occupy now. The Chinese had better food and it was well cooked, while their sleeping quarters were conspicuous for their *apparent* cleanliness and the great care taken to procure personal comfort, good warm bedding and bed clothes, and plenty of these. They did not consume their food in their sleeping quarters, and were not in the habit of indulging to excess in intoxicating drinks as the other races were. The figures speak eloquently in favour of sufficient food, sufficient warmth, and sufficient rest. There are others that might be considered, but those dealt with seem to me to be the outstanding causes which lead up to a death-rate unparalleled in any civilized country, and the bringing clearly into view the framework on which they rest discloses the means by which they may be removed or modified and this death-rate brought more into line with those obtaining for similar industries in other parts of the world.

Conclusions.

(1) The "Reef" population is, as a whole, abnormally susceptible to pneumonia and to tuberculosis, and constitutionally badly prepared to withstand the attacks.

(2) The change from a low to a high altitude disturbs the physiological equilibrium of the blood of new arrivals on the Rand, and renders them extremely susceptible to disease until this equilibrium is re-established.

(3) Putting new arrivals to heavy work before this physiological equilibrium is established (about three weeks) increases the sick lists and raises the death-rate.

(4) The great dryness of the air in winter causes much pneumonia, especially in those coming "off shift," unless effective protective measures are provided and enforced.

(5) The natives are underclad and do not receive sufficient rest or sleep, and their food requires investigation as to its physiological efficiency and proper cooking.

(6) The causes which are responsible for the abnormal death-rate are capable of removal in large measure, and the chief supports of these are—false economy and callous inefficient administration.

PNEUMONIA ON THE RAND.*

By G. D. Maynard.

Memoir I of the South African Institute for Medical Research.†

"Pneumonia," as used throughout this paper, means the disease clinically known as lobar pneumonia when bacteriologically associated with the diplococcus of Fraenkel.

Conclusions arrived at.

(1) The attack-rate and death-rate from pneumonia amongst "tropical natives" living on the Rand are influenced by the country of origin from which the natives are recruited.

(2) The case mortality is apparently independent of the country of origin.

(3) The highest pneumonia attack-rates are found among the gangs which—judged by the number of "detentions" and "rejects"—have the lowest physique.

(4) The greatest incidence of pneumonia occurs immediately on the arrival of the natives on the Rand, and decreases as the period of their residence increases.

(5) The case mortality so far as can be judged from a six-months' record is apparently uninfluenced by the length of residence on the Rand.

(6) Pneumonia is most prevalent during the cold season.

(7) The clinical signs and symptoms of pneumonia among "tropical natives" do not differ essentially from those among Europeans.

(8) The length of the febrile period of the disease is probably somewhat shorter among these natives than among Europeans in the Northern Hemisphere.

(9) While the methods of the termination of the pyrexial stage are similar to those observed elsewhere, the percentage of cases which terminate by "crisis" is, among these natives, lower than the percentages recorded for Europeans in other countries.

(10) There does not appear to be any essential difference in the clinical characters of the attack, nor in the length of the convalescence, whether the fever terminate by "crisis" or by "lysis."

(11) "Second attacks" of pneumonia are most common immediately after the termination of the first attack, and become progressively more rare as the period after the first increases.

(12) The rate of "second attacks" among the population of the previously attacked is higher than the primary attack-rate among the whole population.

(13) The case mortality of "second attacks" is probably lower than that of "first attacks."

(14) Pneumococcal meningitis as a complication of pneumonia appears to be considerably more common among "tropical natives" than among Europeans.

(15) Amongst the natives it is more common to find two or more lobes involved in the pneumonic process than amongst Europeans.

(16) The stage of hepatization of the lung, as observed at the *post-mortem*, bears no constant relation to the length of the illness before death.

(17) The most common day for death to take place in pneumonia is the fourth day of illness.

(18) There is no evidence from the data examined that pneumonia spreads from case to case.

(19) Or that this disease is infectious.

(20) Prophylactic inoculation with a pneumococcal vaccine, when employed immediately on the arrival of these natives on the Rand, appears to

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* From the *Medical Journal of South Africa.*

† "An Inquiry into the Etiology, Manifestations, and Prevention of Pneumonia amongst Natives on the Rand, Recruited from Tropical Areas." By G. D. Maynard, F.R.C.S.E., Statistician and Clinician to the South African Institute for Medical Research.—From the returns of the Witwatersrand Native Labour Association and its hospital records and reports.

reduce the incidence of pneumonia for a limited period.

(21) The protective value is greatest immediately or shortly after inoculation, and progressively diminishes.

(22) Its effect does not appear to last for more than about four months.

(23) In these records there is no evidence that prophylactic inoculation has any influence on the case mortality, except possibly for a very short time after the injection.

(24) The experimental treatment of cases with pneumococcal vaccine does not favourably influence the mortality from the disease.

(25) There is some evidence to suggest that treatment with pneumococcal vaccine of cases which had recently received a prophylactic injection of a similar vaccine was harmful.

System of Recruiting.

On their arrival in Johannesburg "tropical natives" are sent to the W.N.L.A. Association's compound, where they remain under close medical supervision for a further period of at least three weeks. At the end of this time they are again medically examined, and if deemed fit for work are allotted to the mines, but if found to be unfit they are either returned to their homes or detained for a further period.

A native not allotted to a mine at the end of three weeks with the gang to which he belongs is called a "detention"; if he be sent home a "reject." It is considered inadvisable to bring natives from tropical districts on to the Rand during the winter, and, therefore, no recruiting is carried on in these areas during the four months April to July. The summary given below shows the numbers recruited, with the repatriations, detentions, and deaths in the Johannesburg compound. The figures are obtained from the total number of natives arriving in the seasons 1910 to 1911, and 1911 to 1912, and one-half of the recruiting season 1912 to 1913, that is, from August to December 31, 1912.

Summary.

(*Rates per 1,000 in italics.*)

Number of natives recruited, 45,291; detention, 8,817 (*194·7*); repatriation, 1,286 (*28·4*); deaths in compound, 1,449 (*32·0*).

The rates vary considerably with the areas from which these natives are recruited; and there is a high correlation between the number of "detentions" and the number of deaths.

The head recruiter reports that in the districts where the natives with the highest death-rates are recruited the natives are exceedingly lazy, do very little cultivation, and are often, therefore, in a half-starved condition. The differences in the general death-rates are largely due to variations in the prevalence of pneumonia, and from 44 to 82 per cent. of the total death-rate is due to the mortality from this disease. Excluding the group "diarrhœal diseases," cerebro-spinal meningitis is second to pneumonia in importance as a cause of death during the period of residence of these natives in the W.N.L.A. compound in Johannesburg.

Figures relating to tropical natives recruited by W.N.L.A. during the period August, 1910, to December, 1912, inclusive:—

Number of recruits, 45,291; total deaths, 1,449; death-rate per thousand, 32·0. Pneumonia: Cases, 1,809; morbidity rate per thousand, 39·9; deaths, 709; death-rate per thousand, 15·7; per cent. of all deaths, 49; case mortality per cent., 39·2. Other deaths, 740; death-rate per thousand, 16·3. Cerebro-spinal meningitis: Cases, 356; morbidity rate per thousand, 7·9; deaths, 242; death-rate per thousand, 5·3; case mortality per cent., 68·0; death-rate per thousand minus pneumonia and cerebro-spinal meningitis, 11·0.

The treatment of the natives in regard to methods of recruiting, housing, feeding, &c., is practically uniform, except that the varying distance of their homes from the coast necessitates in some cases a lengthy march to the port of embarkation. That this is not a critical factor, however, is shown by the fact that the areas which yield the worst death-rates are not those farthest from the coast. Speaking generally, it appears that the natives from the inland districts are, when residing on the Rand, less prone to the disease than those from the coastal areas. In the United States, when allowances are made for the fact that pneumonia is more prevalent in urban than in rural districts, we find that persons residing in the coastal districts are less subject to this disease than those living inland. In regard to these natives we do not know whether in their homes a similar condition obtains, but if further investigation were to show that this be so, a possible explanation of the reversal of this condition on their arrival on the Rand would suggest itself; namely, that there had been a less rigorous selection amongst the natives from the coastal areas.

Among other possible causes of these differences are:—

(1) That a general want of physique is correlated with a predisposition to all diseases.

(2) That certain tribes are particularly susceptible to pneumococcal infection, or

(3) That some factor favouring the spread of infection may be more marked in some groups than in others, but there is no evidence that a factor of infection has any influence in causing the variation in the death-rates.

The natives from the districts which show the highest death-rates from pneumonia are, in respect to cerebro-spinal meningitis, among the best. The fact, however, that the numbers in these groups are smaller, must not be overlooked. Excluding these two diseases, the territorial distribution of the death-rate for all medical diseases gives a picture very similar to that of pneumonia. It is possible, then, that the distribution of cerebro-spinal meningitis may be due to some peculiarity in method of spread, or in a special constitutional liability, and that general want of physique may still explain the variation in the death-rates from other diseases. We have not, however, at the present time,

sufficient evidence to enable any suggestions to be formulated except in a tentative manner; that a marked and persistent difference in the tribal rates does occur, is, nevertheless, established.

Natives whose physical condition is poor are detained in the W.N.L.A. compound beyond the average twenty-one day period, and, as before explained, are termed "detentions." If their condition is so bad that they are not likely to be fit for allotment to the mines within a reasonable time, they are returned to their homes, and are termed "rejects." The physical condition of these natives also varies from season to season, and at different times during the same season; the number of "detentions" and "rejects" from any group reflects, therefore, to a certain extent the condition of the whole group. By correlating either the general death-rate, or the pneumonia death-rate, with the number of "detentions" or "rejects," the author finds that in gangs where physically inferior "boys" preponderate, both the total and the pneumonia death-rates are higher than where the reverse condition exists. The figures are of interest because they show that the physically inferior gangs have both a higher general death-rate and a higher pneumonia death-rate than those arriving in better condition; and the results, even interpreted on a racial basis, show that racial susceptibility is associated with a degree of physical unfitness.

The prevalence of pneumonia—taking the death-rate as a measure of the prevalence—is greatest amongst natives during their first month of residence on the Rand, and that thereafter it progressively diminishes. With our present figures we can consider this problem as it relates to new arrivals during their first few weeks of residence in Johannesburg. With the exception of loss by death, the population in the W.N.L.A. compound is stationary for all "tropical natives" for approximately three weeks. Dividing the first nineteen days into five-day periods, the number attacked in each period out of a total of 45,291 natives, is as follows:—

TABLE I.

Day after arrival	Number attacked	Attack-rate per cent.
0— 4	526	1·16
5— 9	389	0·86
10—14	314	0·69
15—19	275	0·61

The period of greatest risk is that immediately following arrival, the greatest number of cases being admitted to hospital on the first day. Thus, the liability commences suddenly and immediately after arrival, and decreases subsequently from day to day. It will be observed that the start is within the first twenty-four hours. The actual number of cases recorded is greater in the second twenty-four-hour period, but this is due to the fact that the first period is not really one of twenty-four hours, because the first day as determined from the compound books is often a period of only twelve hours, or even less. The marked reduction in attack-rate with the length of residence is a fact which must not be overlooked when we consider the evidence as to the probability of case to case infection. That this fall continues after the natives are removed to the mines is also shown by other figures at our disposal. In the experiment conducted with 8,123 natives, which is subsequently referred to as the "8,000 experiment," the attack-rate month by month was recorded, and is here given:—

TABLE II.

Month after arrival	Number attacked	ttack-rate per cent.
0	312	3·89
1	203	2·58
2	155	2·00
3	139	1·83
4	125	1·68
5	89	1·22

This table also shows that amongst natives recruited in "tropical areas" the maximum attack-rate occurs immediately on their arrival on the Rand, and gradually falls as the period of residence increases. The influence of season in producing variations in the attack-rate does not in any way enter into the problem in regard to the figures given in Table I; and it is probably not of importance in Table II, because the natives composing the population dealt with in this table were recruited over a period from August to the middle of November, that is, from the coldest time during which recruiting from these districts is undertaken, up to and well into the warm season.

The influence of season and climate must now be considered in so far as the available data permit. Taken in monthly groups, there is a high correlation between cases and deaths; or in other words, the death-rate will serve as a close guide to the attack-rate.

In the season 1911 to 1912 the rate was highest in the colder months, and fell very noticeably in December and January, thus agreeing with an opinion quite commonly held that pneumonia is more prevalent during the colder months. In the season 1910 to 1911 the rate was highest in March and April, but no marked variations occurred from August to February. In the season 1912 to 1913 the maximum rates occurred during the warm weather, a reversal of the condition so marked in the season of 1911 to 1912. If we assume that other predisposing factors remained approximately the same, then from this evidence it would be difficult to state that season had any constant influence on the prevalence of the disease, although the tendency of the figures as a whole suggests that the prevalence decreases in the warmer months.

We have no right, except hypothetically for the purpose of a first approximation, to assume that other factors have remained unaltered. For instance, owing to a dry season in tropical Africa in 1911 to 1912, there was a consequent shortage of crops, and it is possible that this factor may have had an influence on the natives arriving in the season of 1912 to 1913; again, a large proportion of

natives who arrived between November, 1911, and November, 1912, were receiving prophylactic inoculations of pneumococcal vaccine.

The monthly fluctuations in the native distributions are not so marked as in Europe, and natives from British territory show a greater seasonal variation than those from Portuguese territory. Nevertheless, all show lower rates during the warmer months. No new arrivals are being allotted to the mines from May to nearly the end of August, and this factor in itself will, as we have seen, tend to reduce the death-rate observed in these months. Monthly fluctuations among "tropical natives" are, however, much more marked; this is partly accounted for by the fact that the rates are calculated from smaller numbers.

Summing up the whole of this evidence, we may conclude that pneumonia tends to be definitely more prevalent during the colder months. Fluctuations due to other causes, more especially amongst the "tropical natives," may, however, to a large extent mask the effect of season when small groups are dealt with. Further, the effects of season are probably dependent on the meteorological conditions with which they are associated; for instance, the temperature or rainfall of the May of one year might correspond more closely to that of the June than the May of a preceding or following year. The agreement, therefore, between the rates and changes in meteorological conditions might be greater than that observed in the monthly charts. Alterations of weather conditions are, no doubt, highly correlated with season; these facts, nevertheless, must be borne in mind when attempting to interpret the meaning of the foregoing data. Cold or a fall in temperature is the constant factor of the winter season in all parts of the world. In the interior of South Africa the winter season is the dry and dusty season, but in Northern Europe it is the damp season.

A comparison of attack-rate and case mortality shows no close relationship; an increase in the attack-rate does not seem to be associated with an increase of the case mortality.

Clinical and Pathological Aspects of Pneumonia.

The question of second attacks is of particular interest. All cases in which the temperature rises after it has been normal for twenty-four hours or more, when the rise is accompanied by a reappearance of the signs and symptoms of pneumonia, are "second attacks," or recrudescences of the first attack.

Table III.

Rates per Thousand

Month after arrival in which first attack occurred	Months after termination of first attack						Average monthly rate
	1	2	3	4	5	6	
1st	71	13	43	24	43	38	40
2nd	7	38	33	9	0	—	18
3rd	54	24	38	0	—	—	30
4th	40	0	0	—	—	—	14
5th	26	27	--	—	—	--	27
6th	25	—	—	—	—	—	25
	—	—	--	—	—	—	—
	41	22	33	13	22	38	28·7

It will be noticed that there is apparently a tendency for the rates to fall as the length of residence on the Rand increases, a phenomenon also observed for first attacks. Further, although the rates are irregular, owing to their having been calculated from small numbers, there seems to be a tendency for second attacks to become less common as the interval after the first increases.

Out of 1,129 natives who recovered from pneumonia in the W.N.L.A. Compound Hospital, eighty had a "second attack" within thirty days after the termination of the pyrexial period of the first attack; the distribution in days after first attack is shown below:—

Table IV.

Day after termination of fever of first attack	Number of cases of "second attacks"	
0	1	
1	4	
2	12	30
3	4	
4	5	
5	4	
6—10	...	17
11—15	...	14
16—20	...	12
21—30	...	7
Total	...	80

The population throughout this period remained practically constant, and we therefore find a rate of seventy per thousand for second attacks occurring within thirty days of the end of the first attack, as against a rate of forty per thousand for primary pneumonias originating within about a month from the date of arrival of the natives in Johannesburg.

These figures, showing that amongst "tropical natives" in the W.N.L.A. Compound "second attacks" amongst the attacked are more frequent than "first attacks" among the whole population, may indicate that one attack predisposes to a second; or that we are dealing with a particularly susceptible population selected as such by the first attacks. The question is one of considerable difficulty, and in considering it one must not lose sight of the fact that "second attacks" appear to become less common as the period after the first increases; if this be a rule then it would lend support to the suggestion that the first attack actually predisposes to the second. The mechanism of recovery would, however, be difficult to understand on the basis of modern theories of immunity, unless we may accept the suggestion that real differences in strains of pneumococci do occur, and are of pathological significance.

Out of sixty cases of second attacks occurring over a period of six months in the group of 8,123 "boys" (the "8,000 experiment") there were thirteen deaths, giving a case mortality of 21·7 per cent., as against a case mortality of 32·1 per cent. for first attacks in this group. Out of eighty second attacks occurring in the W.N.L.A. Compound Hospital twenty-six died, giving a case mortality of 32·5 per cent., as against 39·2 per cent. for first attacks occurring in the same group. Thus in both groups we see that there is an apparent reduction in the

case mortality from second attacks; at any rate, when they occur within a comparatively short period after the first. It must be remembered that the numbers are small and the probable errors, therefore, large.

BERIBERI IN PORTUGUESE INDIA.*

By Dr. de Mello.

First Epidemic of Beriberi in 1912.

In February, 1912, intimation was received of the outbreak of an epidemic of beriberi amongst the soldiers of the African Company and at the same time several soldiers who were attacked entered the military hospital. The doctors declared that beriberi was an imported disease unknown before 1908.

Observations in the Military Hospital of Nova Goa.

(1) *Beriberi, Confirmed, Mixed Form, Subacute in Type.*—C., a soldier of the Province of Mozambique; strong constitution; age about 20-25 years. The gait was not characteristic; painful œdema of the legs; general œdema, myalgia of the calves; neuritis of the tibial nerve trunks. Alteration in the tactile and thermic sensation; enfeebled reaction of the muscles of the leg to electrical stimulation; abolition of knee-jerk and plantar reflexes. Painful spot of Gayet; epigastric bar. Emybrocardia or Malcompson's sign incomplete; carotid pulse from 120-135 pulsations a minute. Other organs were without any apparent abnormality. Urine contained neither albumin nor casts.

(2) *Early Beriberi.*—J., a soldier from Mozambique, aged between 25 and 30; becomes rapidly tired after marching; dyspnœa after any exertion; tachycardia; wasting of the muscles of the leg; reflexes, sluggish; diminished sensation; pain on pressure over the course of nerve trunks; no œdema; organs normal.

(3) *Early Beriberi.*—S., œdema most marked in the region of the internal malleolus; tibial neuritis; weakness of the muscles of the leg.

But apart from these patients sent to the hospital with the diagnosis of beriberi there were several African soldiers with other diseases. These were also examined because some of them had been complaining for some time of pain in their legs which local applications often succeeded in relieving. One more beriberi patient was discovered in this manner.

(4) *Early Beriberi.*—An African soldier suffering from an inguinal hernia, tibial neuritis, painful œdema in the legs, weakness, tachycardia, &c.

Diagnosis forced itself upon one at a glance; we could not, however, rest there. Sometime before, beriberi had appeared in a disguised form amongst the garrison of the gunboat *Rio Sado*, and sailors serving in this Province had been invalided home to Portugal. As the natives captured by our troops during the revolt had been shut up in the gunboat the patients in the gaol infirmaries were examined and three indigenous beriberi cases found.

(5) *Confirmed Beriberi.*—N. G. G., a native of the province of Satary, Portuguese India; of feeble constitution, aged between 30 and 40; prisoner in the gunboat *Rio Sado*. Trembling gait, very characteristic; has had considerable œdema, commencing in the neighbourhood of the malleoli; this has, however, become very much less; reabsorption of this œdema gives to the skin a dry, hard consistency like a plank of wood. Reflexes and sensation almost normal, but they were at the beginning very feeble. Even at present the muscles of the œdematous region react very feebly to electricity; in the popliteal space the tendons present an abnormal degree of hardness, hindering the free movements of the knee. No albumin in the urine.

(6) *Confirmed Beriberi.*—S. F., native prisoner; walks as if in water up to his knee, painful malleolar œdema. A curious fact is that the œdema began near the left knee. There is no albumin.

(7) *Confirmed Beriberi.*—B. C., a native prisoner. Trembling gait; painful spots of Gayet; beriberi bar, sensation and reflexes diminished.

As observed in Goa, the disease has always begun with pain; this pain is first a simple sensation of fatigue following a march; it soon becomes muscular weakness certainly depending on vasomotor disturbances. Later, without being able to definitely define the period, the painful symptoms change their character, becoming true pains, at the same time the muscles develop a certain degree of flabbiness; they tire very quickly under electrical stimulation and fail to respond altogether after three or four rapid stimulations. After walking it is no longer weakness, but painful cramps that supervene. Pressure over the course of the tibial nerves gives rise to pain, often most acute. It is noteworthy that these latter painful phenomena are often localized in the region of the knee-joint, giving rise at first to a suspicion that the case may be rheumatism and which only subsequent history has confirmed as beriberi. Œdema is the second sign in the chronological order and follows the muscular weakness. One is, however, unable to state what degree of cause and effect or coincidence there is between the œdema and the cramps or neuritis. This œdema has special characteristics; it begins behind the internal malleolus, but it may appear in other situations, for instance, the knee; it is painful and to the touch the skin feels like a board, this hardness becomes very noticeable after the absorption of the œdema.

At this stage we have not observed any other organic change, not even gastro-intestinal troubles, which are declared to be a precursory symptom of beriberi.

It is quite true that some natives suffering from beriberi have been attacked with amœbic dysentery, which had, however, nothing to do with their actual disease. Remarkable above all is the absence of albumin from the urine, a sign which continued negative even in a serious case of œdematous infiltration which we had under observation.

* Abstract of paper read at the All-India Sanitary Congress, 1914.

It is very important to diagnose the disease at this stage because beriberi in its early stages is readily curable by means of simple hygienic measures and symptomatic treatment. Later all the symptoms described in books supervene.

Our observations having been few in number we are unable to compile a more complete list of symptoms. However, all the cases of beriberi in Goa have been of the mixed type and have presented the following symptoms: Anæsthesia involving, in a serious case, the thighs and the lumbar region. The patient does not feel the prick of a needle in the anæsthetic areas. Thermic sensation is less affected, although between the two conditions of abolition and slight diminution of sensation, every possible intermediate condition is met with. There is a zone of anæsthesia and hyperæsthesia; reflexes are diminished or abolished. The following are some of the painful symptoms observed in beriberi patients that have passed the first stage of the disease: Myalgia, spontaneous or easily provoked; a painful bar in the epigastric region, complete or incomplete; the painful spot of Gayet between the second and third dorsal vertebræ and at the point of origin of the eleventh dorsals; it may be noted that the second point of Gayet is situated between the ninth and eleventh dorsals.

Other organs are usually normal. In advanced stages dyspnœa (dyspnœa after exertion is also observed in the earlier stages) and cardiac lesions, embryocardia on Malcompson's sign, congestion of, and sometimes pain in, the liver supervene.

The *post-mortem* examination of M. P. M., originally in the gunboat *Rio Sado*, showed: Hard œdema in the legs, on the right leg a very tight cord, possibly applied to relieve pain; congestion of the lungs, congestion being more marked in the left lung; fatty degeneration of the heart, large ante-mortem clot; hæmorrhagic effusion in the pericardial cavity, the liver granular and showing fatty degeneration. The lesions found in the heart explain the sudden death, and that beriberi was the disease from which the deceased had suffered.

We can then declare, without any fear of contradiction, that *the disease which in February*, 1912, *prevailed amongst the African soldiers and the native prisoners was indeed beriberi.*

Beriberi at Goa before the Epidemic of 1912.

The first case of beriberi was seen in 1908. Some sailors in the gunboat *Rio Sado* were attacked by it and sent back to their country; one or two died during the voyage. In 1910 beriberi was hardly spoken of, but a short time after evident signs of it were again seen in the Naval Hospital.

Our colleague, Sousa Machado, on duty in the gunboat, has often had an opportunity of studying beriberi, and one of us has several times been on a medical board to examine patients with a view to sending them back to Portugal. A student at our Medical School submitted in his thesis a typical description of beriberi of the mixed variety, and his very suggestive recommendations as to the accommodation of sailors in the barracks of the town have been published in the second and third numbers of the *Boletim Geral de Medecina e Pharmacia*, p. 181 ("Contribuçäo as estudo da etiologia do béribéri" por J. C., Provença Bragança). All the doctors who examined the sick sailors have been in agreement with the diagnosis, and we can affirm: *The sailors of the gunboat "Rio Sado" were in* 1910 *and* 1911 infected with *beriberi.*

On May 11, 1912, a prisoner, B. C., aged 56, was admitted to hospital with a history of malarial fever and suppuration of the external ear. Otherwise has enjoyed very good health; the patient made some long marches without having experienced any fatigue or swelling of the feet; not alcoholic. His actual illness started in the gunboat where he was imprisoned and where his work was washing down the decks.

His feet are swollen and the swelling extends up to the legs and thighs, making walking difficult on account of the pain and fatigue that he experiences at present. In addition he complains of a dry cough and shortness of breath. He has œdema, tibial neuritis, and atrophy of the left leg; cutaneous sensation abolished in the lower third of the leg and diminished in the upper two thirds; absence of the plantar reflex, abolition of sensation to pain as high as the lumbar region; slight tricuspid murmur, râles scattered over the lungs; enlargement of the spleen. The patient recovered under treatment.

The boat was placed under medical observation in order that prisoners with signs of beriberi could be placed under treatment at an early stage of the disease. As a local defensive sanitary measure the order was issued that no prisoner would be allowed to proceed to his destination without a previous medical examination.

A Fresh Epidemic in 1913, occurring only amongst African members of the Expeditionary Force.

After August 15, 1913, a fresh epidemic began amongst the African troops; forty, fifty, sixty soldiers, a whole company went down with it, and at the moment of writing (October 13) there are still patients suffering from it in the beds of the infirmary.

The clinical form is the same and, what is important, many soldiers who had been attacked in February have relapsed again. I have good reasons for believing that the disease was resting in a dormant form in the people previously attacked and the germ (let us again use the word, although it has not yet been discovered) again became virulent, facilitated by the condition of exceptional susceptibility that African races possess towards this disease.

It is important to remark that no native in the neighbourhood of the fortified posts occupied by the African garrison has contracted the disease.

The native of Satary lives on *nachinim* (*Eleusina indica Roxburgh*), *pacol* (*Paspalum scrobiculatum Linneu*), *orió* (*Paspalum miliaceum*), rice (*Orysa sativa Linneu*), and *sanvon* (*Panicum crux-galli*),

These cereals are usually eaten in the form of farinaceous cakes. Sometimes, though very rarely, so rarely that such occasions can be looked on as festivals, the food of the native of Satary is supplemented with coco-nut, palm sugar, lentils, setaria italica, and a little fresh fish. Not a single case of beriberi has ever been seen.

The rations of the African soldier before the epidemic were: White rice, 1 litre; white haricot beans in butter, 0·2 litre; coco-nut oil, 0·25 litre; beef or fish, 0·2 litre. In case of scarcity of meat a box of sardines preserved in olive oil was substituted.

After the epidemic, on the recommendation of the Sanitary Officer: Red rice cured in Mangalore, 0·5 litre; meat, 0·5 litre; potatoes, 0·3 litre; fish, 0·4 litre; various vegetables, 0·2 litre; various beans, 0·2 litre. And in spite of this change of diet beriberi continued amongst the African company of the Expeditionary Force.*

What is the Origin of Beriberi at Goa?

This question is a very complicated, delicate and difficult one to answer. Let us see what light our studies can throw on its obscurity. In the first place we are up against two distinct opinions:—

(1) That beriberi is a disease which exists in Goa in some endemic form.

(2) That beriberi is a disease that has been imported into this country and at a relatively recent date.

The first cases of the disease made their appearance among the sailors of the gunbot *Rio Sado*, during the time of the rains, in a barrack which is used as a depôt for materials of war. It was said that the infection on the gunboat began with a sergeant of marines, who contracted the disease at Lourenço Marques, and who probably came to India without having completely recovered from the disease. Here he underwent a second attack exactly like the first, or perhaps a re-infection, and the naval Sanitary Authorities sent him back to Lisbon. Soon after various officers and soldiers of the gunboat contracted beriberi and were isolated in the convents of Velha-Gôa and the infantry barracks in Nova-Gôa, and the infection has continued surreptitiously attacking from time to time soldiers of the marine.

Since this first appearance there have been two recrudescences each time after the rainy season. At first sight it was thought that beriberi might have come from the barracks or from houses situated in the near proximity. Superficial appearances seemed to justify this hypothesis, but more mature considerations immediately destroy these first impressions. Indeed, that portion of the barracks where the sailors stayed was used formerly as a store for salt for the long period of twelve years, and not a single case occurred in Gôa during these twelve years, although all the inhabitants of Gôa consumed the salt that came out of these godowns.

For one year the regiment of artillery was quartered in the same place. These barracks were used by the infantry and the band, and not a single man of them ever contracted beriberi. In the same line and forming part of the same building, and on the same level, is the European infantry barracks; and quite close are some houses belonging to rich Hindus, and no one living therein has ever suffered from a complaint which was in any way suspected as being beriberi.

Suggestions put forward that beriberi originated from some houses of prostitutes have not been any more fortunate. These women are submitted to medical inspection, and the servants of the hospital (Africans) that live in the same quarter have never evidenced the slightest trace of beriberi.

All this is worth reporting, and our attention ought to be specially directed to those cases which were due to infection contracted in the gunboat as well as in the fortress of Aguada.

The following conclusions can then be formulated: (1) Beriberi has not previously existed at Gôa; (2) beriberi actually existing in Gôa at the present time is an imported disease; (3) although nothing can be definitely stated as to the origin of infection, one can say, however, that the primary focus developed in the gunboat *Rio Sado;* (4) one cannot state definitely whether the African soldiers contracted the disease at Gôa or brought it from Mozambique. However, my opinion inclines me to believe the first hypothesis, the place where they would have contracted beriberi would be the gunboat *Rio Sado*, where these soldiers had for some days been on sentry duty; (5) judging from our experience in Gôa it can be affirmed that beriberi is an infectious disease.

Etiology and Pathology of Beriberi.

Beriberi enjoys a vastly extended geographical distribution which can perhaps be subordinate to four important foci.

Asiatic focus, from which radiations starting from the extreme east of Asia have reached the Malay Islands, Australia, New Caledonia, and nearly all the Oceanic Islands, which constitute the *Oceanic focus*, *African focus*, *American focus*.

Europe has been free from endemic beriberi, but slight epidemics are not rarely seen in the ports of Western Europe. One cannot say so much about ship beriberi, because epidemics developed on board French and Japanese cruisers demonstrate the existence of a ship beriberi where no hygienic conditions are lacking.

The theories which attempt to solve this difficult problem can be classed into five groups: Infectious, parasitic, toxic, alimentary, and symptomatic. Let us begin the discussion of these by taking first into consideration the least likely.

The Symptomatic Theory.

Nocht and Durek maintain that beriberi is a syndrome which develops in different circumstances

* Nearly all the patients are very anæmic. An examination f o their blood has shown eosinophiles, often amounting to 30 per cent, due certainly to intense infection with worms iu the cases examined.

and under the influence of various causes. Nocht divides his hypothesis and imaginary syndrome into three groups: (1) The infectious form, of which the cause and mode of transmission are unknown; (2) the alimentary form, due to imperfect foodstuffs; (3) the scorbutic form, due to troubles of nutrition.

Notes and News.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT (44TH SESSION, JANUARY-APRIL, 1914).

J. H. Castro, M.D.(Salvador); S. F. Chellappah, M.R.C.S., L.R.C.P., L.M.S.(Ceylon); S. Colyer, M.D.(Lond.), M.R.C.P.; V. St. John Croley, L.R.C.P. & S.(Edin.); A. L. Fitzmaurice (Colonial Service), M.B., B.S.(Lond.), M.R.C.S., L.R.C.P.; E. Gibson (Colonial Service), L.R.C.P. & S.(Edin.); Bernard Haigh, M.R.C.S., L.R.C.P.; G. G. Jolly (Capt. I.M.S.), M.B., Ch.B., D.P.H., with distinction; J. Marmion, L.R.C.P. & S.I.; G. M. Millar (Capt. I.M.S.), M.B., B.Ch.B., A.O.(Dub.); C. J. B. Pasley (Colonial Service), M.R.C.S., L.R.C.P.; I. Ridge-Jones, M.R.C.S., L.R.C.P.; Miss E. N. M. Ross, M.B., Ch.B.(Glas.); N. S. Williams (Colonial Service), M.R.C.S., L.R.C.P., with distinction.

SOUTH AFRICAN LEGISLATION.

THE South African correspondent of the *Lancet* of March 28, 1914, states that: "So far as the intentions of the Government have been announced, it is only proposed to ask Parliament to pass an Indemnity Bill and necessary financial measures during the present session. It is expected, however, that the medical members will insist upon the conditions on the mines being brought under review, and particularly the working of the Miners' Phthisis Compensation Act, which has been responsible for much criticism. Also it would seem likely that an effort will be made to get the Government to establish a definite Medical Department responsible for health conditions on the mines, and also for the medical treatment of mine natives. . . . It is felt that the State should step in without further delay and establish a sound organization to take control and enable the workers on the mines to feel that Government is rendering their calling less dangerous and striving to reduce the present appalling death-rate."

SHIP SURGEONS.

THE conditions of service of ship surgeons in the P. and O. Company are now as follows. On all boats, with the exception mentioned, the rate of remuneration is £15 a month, with the right to charge first and second saloon passengers 5s. and 2s. 6d. respectively for each consultation. On boats engaged on station duty the rate of pay is £20 a month, with the same right to charge passengers for medical services. All drugs and instruments are found by the Company. Surgeons' cabins are now in all cases outside ones, and in all ships there is, in addition, a surgery and hospital cabins.

The rate of remuneration of ship surgeons on the South American mail steamers of the Royal Mail Steam Packet Company and the Pacific Steam Navigation Company has been fixed at £12 10s. per month; on the Royal Mail Steam Packet Company's West Indian, Canadian, and "D" Class steamers to South America the pay is now £14 10s. per month. In addition to this pay they are allowed to charge fees for professional attendance on passengers as follows: 5s. a visit to first-class and 2s. 6d. a visit to second-class passengers. Surgeons on the Company's steamers have a private cabin and a surgery set aside for their use, and there is also a hospital fitted with every modern convenience. Hospital attendants are carried on the mail boats, and doctors on the Royal Mail Steam Packet Company's mail steamers are in addition allowed a personal servant.

Reviews.

RENAL DIAGNOSIS IN MEDICINE AND SURGERY. By Dr. Victor Blum. Translated by Wilfred B. Christopherson. Pp. vi + 144. London: John Bale, Sons and Danielsson, Ltd. 1914. Price 7s. 6d. net.

This book describes the work of functional renal diagnosis with examples chosen from clinical experience. Renal surgery owes many of its advances and extensions for and against nephrectomy and nephrotomy to functional renal investigation. Not the least valuable are the methods of treatment of the various forms of renal complaints due to new methods of investigation.

The book is divided into renal physiology, renal competency and incompetency, renal functional diagnosis, topical diagnosis, and the significance of these in surgical and medical treatment. An excellent description is given of the interpretation of renal skiagrams and conditions liable to cause confusion.

Despite the fact that the author omits to refer to a certain amount of recent work in England and America, yet an up-to-date record of German and most French research work more than compensates, especially as a full bibliography and table of contents are given.

HYGIENE AND DISEASES OF INDIA. By Lieut.-Col. Patrick Hehir, I.M.S. Madras: Higginbothams, Ltd. Pp. 1,000. Price Rs. 6.8, or 8s. 8d.

The third edition of this well-known work will be welcomed by all residents in India and medical men about to settle there. As a comprehensive elementary textbook it amply repays careful study. As a popular manual the division into sections is distinctly useful, for everyone in the Tropics is bound to study not only personal, but also general hygiene, as well as the diseases of India. A book of this description should always be at hand in case of emergency.

Original Communication.

MURMEKIASMOSIS AMPHILAPHES.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.
AND
J. B. Christopherson, M.A., M.D., F.R.C.P., F.R.C.S.
Director, Khartoum and Omdurman Civil Hospitals.

Introductory.

Quite recently we have met with a peculiar form of cutaneous wart characterized by an extraordinary facility for growth, causing it to spread and to occupy practically the whole of the right side of the face and neck, involving the external auditory meatus, destroying the right eye and even invading the mucous membranes of the mouth, gums, tongue and throat, and thus giving rise to the condition depicted in figs. 1 and 2.

Microscopically the points of interest about this curious warty mass are the presence of numerous cryptococci (figs. 6 and 8), and the fact that the cutaneous warts are largely composed of an adenoma derived from sebaceous glands (figs. 5 and 9), which feature is absent in those on the tongue (fig. 11).

As the disease is readily curable by operation this demonstrates the necessity for a knowledge of its symptoms in order that an early diagnosis may be made before terribly extensive operative proceedings become necessary or before the warts invade the mouth and pharynx, from which positions it is impossible to eradicate them.

This disease may possibly have been seen in England, as Lilley described a somewhat similar warty growth, but he does not mention the presence of cryptococci or any connection of the cellular part of the growth with the sebaceous glands, and the name Naevo-carcinoma, which he gives to the growth, scarcely agrees with the clinical description, while the very slight account of the morbid anatomy leaves some doubt as to what the real condition may be. Lilley's case, however, will be described in greater detail further on in this paper, and if it eventually proves to be an analogous condition will tend to show that the geographical distribution of the disease is not limited to the Sudan.

Historical.

Several varieties of warts were known to the ancient Greek writers. They mention a type which was slender at the base and more expanded on the surface, and to this the name "*Akrochordon*" (*ἀκροχορδών*) was given.

The second type included warts which were easily divisible into parts and were apt to bleed, and to such a wart the term "*Thymion*" (*θύμιον*) was applied because it was considered to resemble a piece of thyme.

The third type was broad and sessile and occurred on the palms and soles. It gave rise to sensations resembling those caused by insects creeping over the body and was therefore called "*Murmekia*" (*μυρμήκια*) from the Greek name for an ant-hill.

The above classification was adopted by Celsus in the fifth book of his "De Medicina." Pliny, however, altered the nomenclature by applying the Latin name for a height—"Verruca"—to the description of a wart, and since his day this has remained the commonly accepted name, although the Grecian names are older and more original.

Galen, however, used the term *Murmekia* and coined a new word, "*Murmekiasmos*" (*μυρμηκιασμός*) to denote the breaking out of warts on the body.

This early classification remained practically unaltered until Alibert, in 1825, attempted to add two new forms, "*Les Fics*" and "*Les Verrues de Cicerón*," but these did not become established, and indeed, in 1911, Whitfield only recognizes (1) the common flat-topped wart, (2) the filiform and fungiform warts, and (3) the senile or seborrhœic wart.

In general, modern authors, such as Crocker and Sequeira, recognize: (1) Verruca vulgaris, (2) V. filiformis, (3) Vacuminata, (4) V. plana juvenilis, (5) V. plana senilis, (6) V. plantaris, and (7) V. digitata.

The definition of a wart as given by Crocker is: A small papillary growth with a horny covering variable in size, shape, and consistency—and the individual elements of the peculiar condition which we are about to describe agree with this definition.

When, however, the morbid anatomy of the growths is studied, it is seen that there is a marked proliferation of the sebaceous glands associated with the wart and the question arises whether the whole condition should be looked upon as merely an adenoma of these glands. We think that this is not the view to be taken, but that the real clinical feature, judging by the warts on the tongue, is the presence of a wart which slowly spreads, covering a relatively large area, and that this wart, when cutaneous, is associated with a proliferation of the sebaceous glands, the whole possibly depending upon the cryptococcal invasion.

The most important clinical feature of the disease is the wart, and therefore we propose to name this apparently new human disease "Murmekiasmosis Amphilaphes," using Galen's term for the "breaking out of warts" on the body, together with the Greek adjective for "spreading," and adding to Galen's word the termination "is" in order to bring it into accord with modern nomenclature. In choosing the spelling of these words we have been influenced by the modern tendency to use the Greek letters "k" and "u" instead of converting them into "c" and "y," as used to be done in bygone years.

It may be contended that we should have used the term "*Cryptococcomycosis*" for this condition, believing as we do that the disease in its active form may possibly be due to a cryptococcus (fig. 6, *a*, *b*, and *c*), but firstly we have failed to transmit the disease to monkeys and dogs by inoculation, and have therefore failed to reproduce the warts and therefore have not proved that the cryptococcus is

the causal agent. Secondly, as we shall show later, the genus *Cryptococcus* of Kützing is probably only retained because we do not know the full life-history of the species; therefore, taking these two points into consideration, we are of the opinion that a name which describes the clinical condition without advocating any theory is the best, and therefore we prefer the name "Murmekiasmosis Amphilaphes." We believe we are the first to describe this condition, unless Lilley's case of Nævo-Carcinoma (Melanotic) of the scalp proves on further examination to be the same disease.

Lilley published a paper entitled "Notes on a Case of Nævo-Carcinoma (Melanotic) of the scalp in a boy aged 19," in the *British Journal of Dermatology* for December, 1912.

The history which he gives of the onset of the disease and the excellent photograph with which he illustrates his paper suggest strongly to our minds that he was dealing with a condition like the one we are about to describe.

The term Nævo-Carcinoma is peculiar as no glandular enlargements or metastases could be found, although the growth is said to have steadily increased from the patient's fifth to his fourteenth year, and to have then remained quiescent until a few months prior to being seen, when it began to grow rapidly.

Again, the fact that, from the date of the operation in March or April until December, 1912, no sign of any recurrence could be found also militates against the view of the malignant nature of the disease, but the pathological description is so exceedingly meagre as to leave it open to question whether the two conditions may not be variations of the same disease, *i.e.*, a warty growth associated with a proliferation derived from the sebaceous glands.

Geographical Distribution.

Our case occurred in a boy who came from El Damer, a town situate on the Nile north of Khartoum.

Racial Distribution.

The boy was an Arab belonging to the Jaalin tribe, celebrated because of its almost total extinction under the Khalifa's rule.

Etiology.

After removal the warts were cut vertically and films made from scrapings of the white central portion. These films were sometimes fixed with osmic acid and treated by the moist method, and in other cases were simply fixed by drying. After fixation they were coloured by Leishman's or Giemsa's stain, when they were found to contain a number of roundish bodies with a definite double contour. These bodies in the fixed and stained condition vary in size, some measuring about 1·4 and others about 2·1 microns in diameter (fig. 6). They contained no visible nucleus or differentiated cellular contents. Some of them (fig. 6, *a*, *b*, and *c*) appeared to be forming buds, thus giving rise to the well-known cottage-loaf-like appearance which is characteristic of budding yeasts. It was therefore concluded that they were yeasts.

Attempts at cultivation on a large series of media at 20° C., 37° C. and 40° C. failed to produce any growth. Inoculations into monkeys and dogs failed to reproduce the disease and sections of the warts stained by various methods failed to show any other form of reproduction beyond that of gemmation, and therefore it was concluded that these bodies belonged to the genus *Cryptococcus Kützing* 1833.

Examinations of sections coloured by Leishman's stain, by Gram's method, by iron hæmatoxylin and by the Oxford method reveal the presence of these cryptococci lying among the superficial horny cells (fig. 8), deep in the recesses between the papillary processes of the wart. Further examinations show the same bodies in the epidermis, in the depressions leading to the sebaceous glands, and in the sebaceous glands (fig. 7), as well as in the epithelium and in scrapings from a lingual wart (fig. 6*c*).

This extensive distribution, together with the presence of the organism in perfectly fresh specimens, has induced us to believe that there may be some causal relationship between the cryptococcus and the wart. We are supported in this view by the absence of cryptococci from ordinary warts of the Sudan, from blastomycotic warts and leishmania nodules, in all of which it was possible to conceive that they might have lived parasitically without being the causal agent.

Cryptococci are not uncommon in the Sudan and we propose shortly inviting attention to another skin disease in which they apparently play a causal part; but this cryptococcus appears to us to be quite different from the one we are dealing with at present because it can be cultivated and because it is associated with quite different pathological features.

Yeast-like bodies can be found in the scrapings of apparently normal skin of persons suffering from saccharomycetic diseases and in the mouth and fæces of apparently normal people.

It might therefore be contended that the warty cryptococci were simply living harmlessly in the morbid tissues, but we are not in favour of this view, though we are unable to advance any proof absolutely contrary to it, and though we have been unable to find or to grow any other organisms beyond those usually present in normal skin or in the mouth.

We are inclined to believe that this is a new species of cryptococcus, because we have failed to meet with any literature referring to any species of this genus associated with warts. There is, however, so much confusion with regard to the genus cryptococcus that a brief review of the subject appears to us to be necessary before finally naming what we think to be a new species.

The order of the fungi called ascomycetes contains a sub-order established by Brefeld and variously named hemi-ascomycetes, hemi-asci, proto-asci and gymnascales. This sub-order, which contains three families, the gymnoasceæ, the exoasceæ and the saccharomyceteæ, is looked upon by many authorities as a link between the phycomycetes and the true

PLATE I.

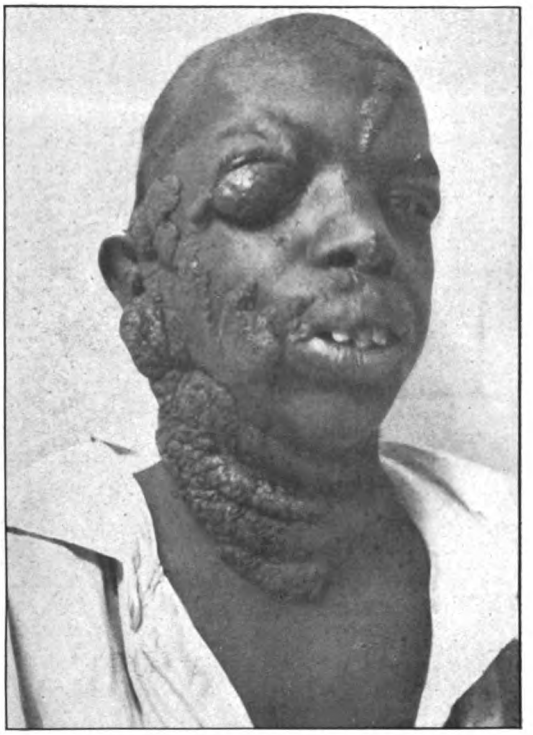


FIG. 1.

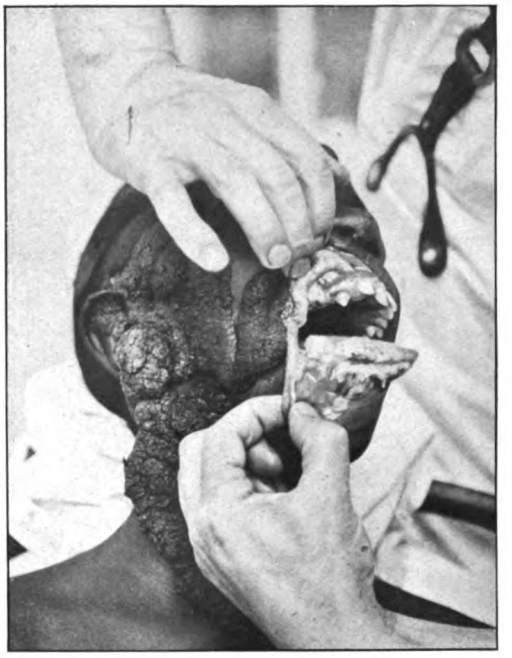


FIG. 2.

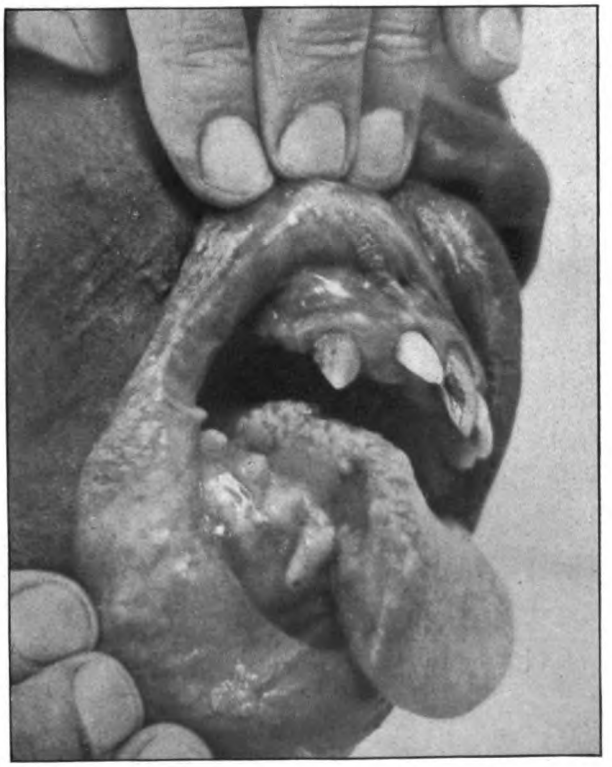


FIG. 3.

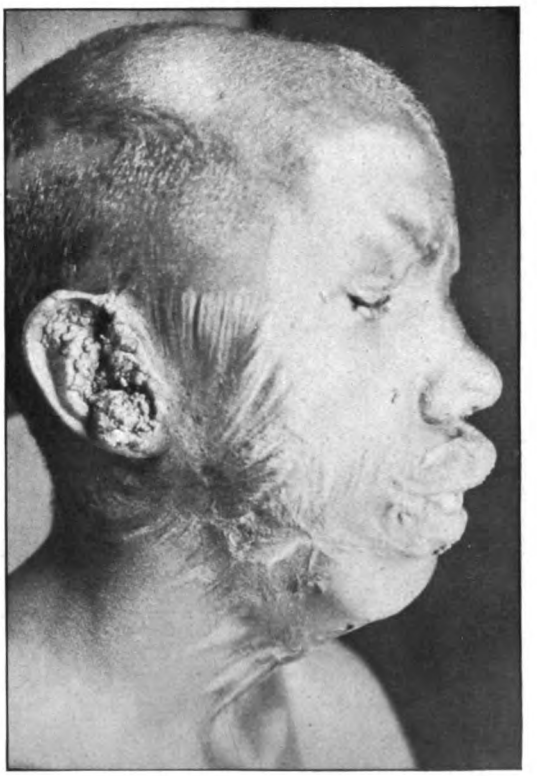


FIG. 4.

To illustrate article, "Murmekiasmosis Amphilaphes," by ALBERT J. CHALMERS, M.D., F.R C.S., D.P.H., and J. B. CHRISTOPHERSON, M.A., M.D., F.R.C.P., F.R.C.S.



PLATE II.

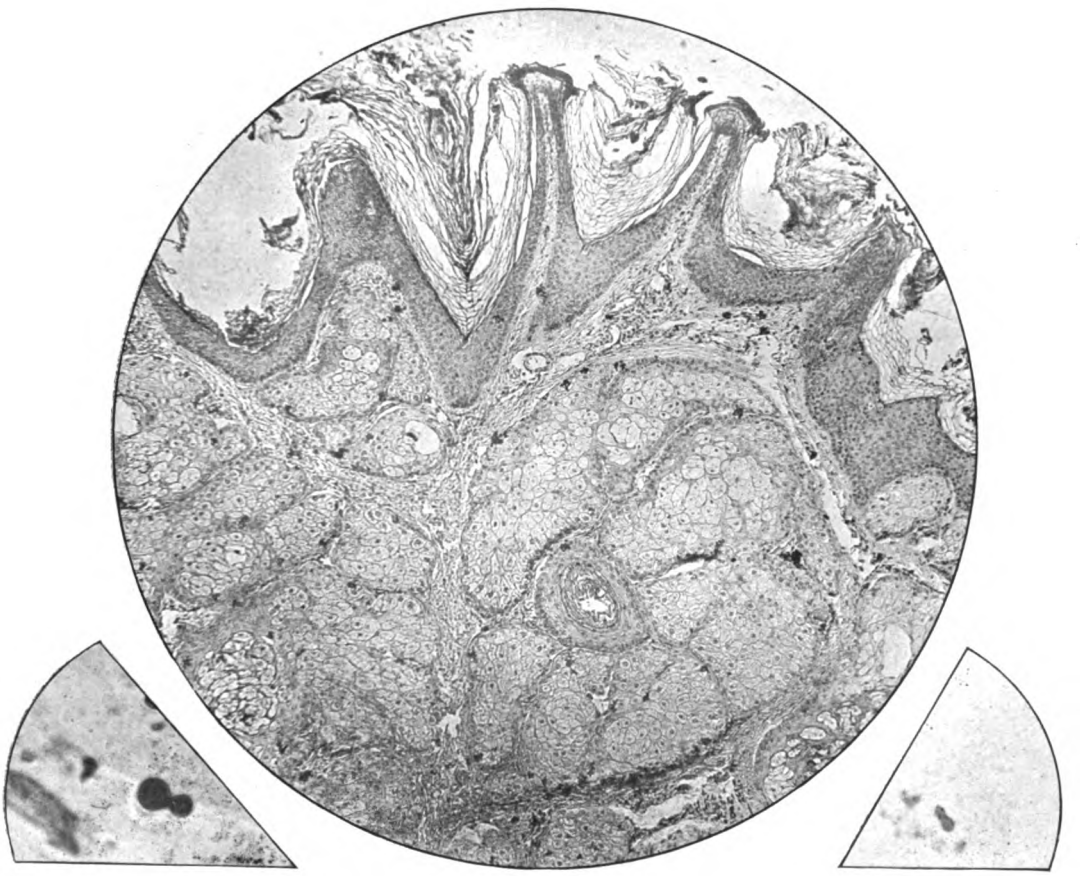


FIG. 6*a*. FIG. 5. FIG. 6*c*.

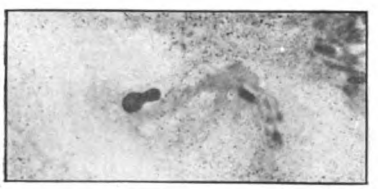


FIG. 6*b*.

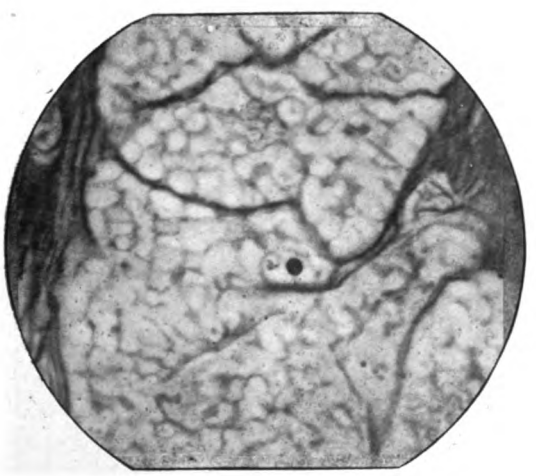


FIG. 7.

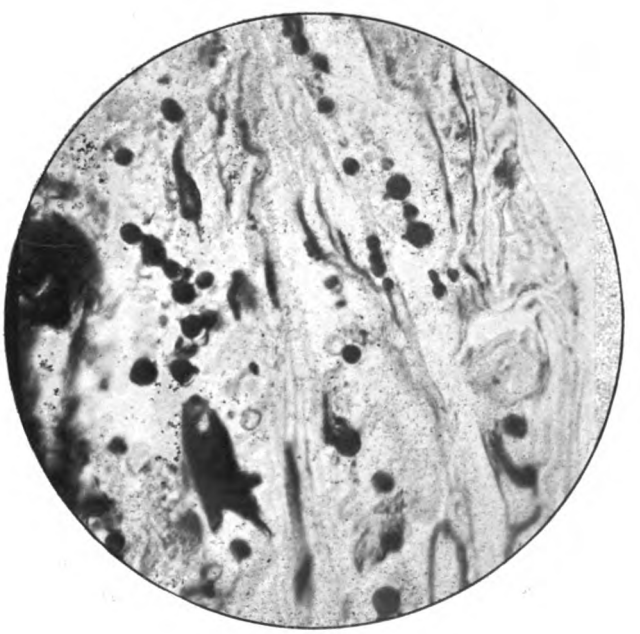


FIG. 8.

To illustrate article, "Murmekiasmosis Amphilaphes," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H. and J. B. CHRISTOPHERSON, M.A., M.D., F.R.C.P., F.R.C.S.



PLATE III.



FIG. 9.

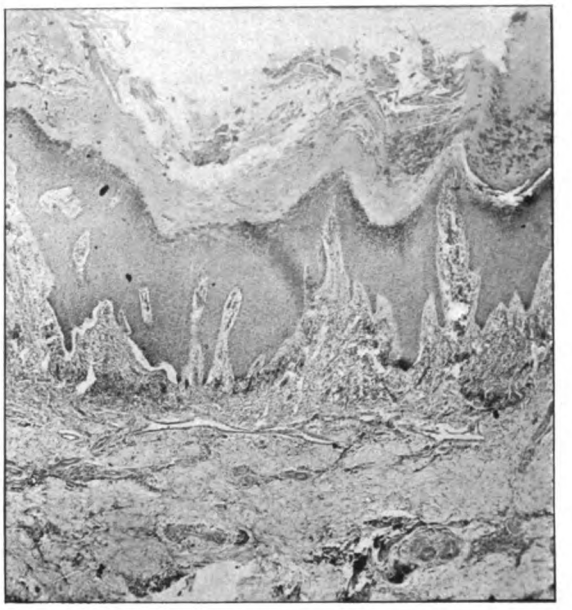


FIG. 10.

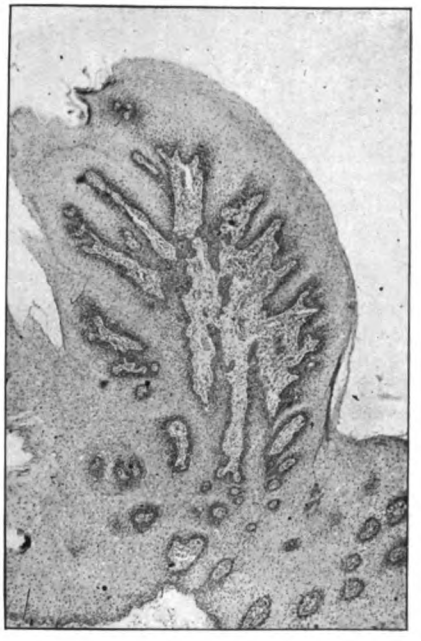


FIG. 11.



FIG. 12.

To illustrate article, "Murmekiasmosis Amphilaphes," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and J. B. CHRISTOPHERSON, M.A., M.D., F.R.C.P., F.R.C.S.



ascomycetes, and indeed its founder, Brefeld, believed that in process of evolution the sporangium of the phycomycetes had been converted into the ascus of the ascomycetes.

The hemi-ascomycetes may be provisionally defined as: "Fungi, parasitic or saphrophytic, mostly minute, with asci, without or with only a rudimentary perithecium, and having often a variable number of spores."

This definition covers three families, gymnoasceæ, exoasceæ and saccharomyceteæ, which are distinguished by the fact that the gymnoasceæ have a rudimentary perithecium while the exoasceæ and saccharomyceteæ have no perithecium at all. The exoasceæ are parasitic on living plants and their asci form a continuous layer on the infected stratum, while the saccharomyceteæ consist of single cells which reproduce by budding or division and are known in some genera to form ascospores inside an ascus. They may be parasitic or free living.

The saccharomyceteæ contain the zygosaccharomyces of Barker, in which conjugation precedes the formation of ascospores; the schizosaccharomyces of Beyerinck, in which division, instead of budding, takes place and in which an ascus is formed after conjugation; the saccharomyces of Meyen, in which reproduction takes place by budding and by ascus formation without conjugation, the spores being round or irregular; Willia, in which reproduction takes place by budding, the spores being pileiform or limoniform and ridged; and the cryptococcus of Kützing, which was renamed atelosaccharomyces by de Beurmann and Gougerot in 1909, and in which only reproduction by budding is known, ascus formation not having been observed.

It is obvious that as only reproduction by budding is known, cryptococcus must be looked upon either as a specialized or degenerate form of saccharomyces or as merely a provisional genus in which to place yeast-like forms, the full life-history of which is unknown.

The fact that when grown for several generations, as in Busse's case, it continued in its cryptococcal or yeast-like form is in favour of the view that some, at all events, of the species have become highly specialized and have lost all other modes of reproduction except budding. If this is correct, then cryptococcus would become an established genus, though at present the general tendency is to view it as merely a provisional genus.

But having defined the systemic position of cryptococcus we are unfortunately only at the beginning of the difficulties which beset the species of this genus, and to understand the present state of our knowledge it is necessary to review their history.

The name "Cryptococcus" was introduced by Kützing in 1833 as the generic name for certain forms of his algæ, which he classified as belonging to the sub-class Malacophyceæ, tribe Gymnospermeæ, order Eremospermeæ, sub-order Mycophyceæ, and family Cryptococcaceæ. This family he defined as: "Globuli gonimici minutissimi mucosi in stratum indefinitum aggregati," and in this family he placed three genera, Cryptococcus, Ulvina, and Sphærotilus. The genus Cryptococcus was characterized as: "Globuli gonimici in stratum amorphum diffusum aggregati." In this genus he gathered no less than thirteen species, all described by himself and mostly found in water or in pharmaceutical preparations.

His twelfth and thirteenth species were, however, more interesting, as they were called *Cryptococcus cerevisiæ* and *C. vini*.

In 1838 Meyen (usually misspelt, being written Meyer) separated *C. cerevisiæ* from the genus Cryptococcus, because it reproduced by ascospores as well as by budding, and to this new genus he gave the name *Saccharomyces*, so that *Cryptococcus cerevisiæ* became *Saccharomyces cerevisiæ*.

Cryptococcus therefore remained for those yeast-like fungi which do not reproduce by ascospores but only by budding.

The removal of the species cerevisiæ from *Cryptococcus* was not recognized by Charles Robin, and with it he grouped the fungus found by Remak in 1845 in the biliary passages and intestines of rabbits, and to which in 1847 he gave the name *Cryptococcus guttulatus*. Later, however, it was also shown to belong to the genus Saccharomyces.

In 1873 Rivolta noticed peculiar bodies in a form of lymphangitis in horses, and in 1883 he and Micellone named this organism *Cryptococcus farcimimosæ*, but another view is that this so-called cryptococcus is not a fungal but an animal parasite, which is referred to Gasperini's genus *Lymphosporidium*.

During this period one or two organisms had a temporary resting-place in this genus, *e.g.*, Fresenius's *Cryptococcus glutinus*.

The first case in which a cryptococcus was definitely proved to be the cause of disease was Busse's case of cystic swellings of the tibia in a woman, aged 31.

The bodies in question were first seen by Buschke, but it was Busse who first proved that they were the true cause of the disease and showed that they were pathogenic to animals.

These yeast-like organisms were found at the autopsy some thirteen months later to occur in sarcomatous-like growths consisting of young granulation tissue and giant cells, not merely in the cysts but also in the lungs, kidneys, spleen, and in a vesicle on the cornea.

The organism grew well on potato and in acid media. It fermented glucose and was specially pathogenic for rats. It only reproduced by budding and no endospores or mycelium were ever seen. It was this that induced Vuillemin to give it the name *Cryptococcus hominis* 1901.

Including *C. hominis*, and after excluding several wrongly classified forms, there are about fourteen species parasitic in man which can at present be referred to the genus Cryptococcus, *e.g.*:—

Cryptococcus breweri Verdun 1912, described in an abscess of the vertebral column; *C. tonkini Legendre* 1911, found in two cases of blastomycosis in Indo-China.

In addition a number of cryptococci have been found associated with cancers, sarcomata and innocent tumours, *e.g.*, *C. plimmeri Constantin* 1901, *C. degenerans Vuillemin* 1896, *C. corsellii Neveu-Lemaire* 1908, *C. hessleri Rettger* 1904.

The following have been found in the mouth or throat: *C. sulfureus Beauverie and Lesieur*, 1912, *C. lesieuri Beauverie and Lesieur* 1912, *C. salmoneus Sartory* 1911, *C. guillermondi Beauverie and Lesieur* 1912, *C. rogeri Sartory* 1911, and *C. linguæ-pilosæ Lucet* 1901.

According to some authors, *Histoplasma capsulatum Darling* 1906, is not an animal but a vegetal parasite and should be classified as a cryptococcus.

The parasite found in cases of chronic ulcerative dermatitis in America, and often named *Cryptococcus dermatitis Gilchrist and Stokes* does not belong to the genus *Cryptococcus* of Kützing but to the genus *Mycoderma* of Persoon, 1822.

In our opinion the cryptococcus which we have just described does not agree with any of the already named forms. It certainly agrees with those found in tumours, as it is associated with a warty growth, which in its turn is largely composed of adenomatous sebaceous gland tissue. These warty growths are, however, innocent and not malignant. Taking these matters into consideration we feel justified in naming this organism by the Latinized words—*Cryptococcus myrmeciæ Chalmers and Christopherson* 1914.

Pathology.

It is not possible at present to write fully on the subject of the pathology of these warts as, in the interests of the patient, it was deemed inadvisable to remove more than one wart on the tongue, and therefore the growths in the mouth and throat were left for the time being.

The pathology of the skin warts is obviously that of a hyperkeratosis and an acanthosis (or proliferation of the prickle cell layer of the epidermis), associated with a similar process in the germinal layer of the sebaceous glands. The first two of these proliferations produce the warty condition, while the third gives rise to the adenomatous features of the wart. But the nature of the growth from the germinal layer of the sebaceous glands suggests the possibility that in some cases it might remain as solid strands of cells which do not form sebaceous material, and perhaps this is the condition in Lilley's case. If this were so it would produce an appearance analogous to the carcinoma.

The pathology of the lingual wart is that of an "acanthosis" with some irritation of the mucosa.

The peculiar tendency to spread suggests the action of some slowly working causative agent of an infective nature, while the presence of the cryptococci in the epidermis, the depressions leading into the hair follicles and, though more rarely, in the cells of the sebaceous glands, as well as in the epithelium of the lingual wart, makes their etiological influence probable, as in these situations they may give rise to a mild amount of irritation capable of producing hypertrophy and incapable of producing degeneration or cancer formation.

The non-recurrence after removal, the lack of metastases and the non-implication of the lymphatic glands, together with the lack of any effect on the bodily nutrition, show that the process is non-malignant and are in favour of a local causal agency, possibly the cryptococci.

The dark colour of the cutaneous warts is due to the natural colour of the skin and is absent in the oral and pharyngeal warts.

Morbid Anatomy.

The naked-eye appearance of a portion of the cutaneous growth is that of an ordinary sessile wart with marked papillæ separated by sulci, while in the mouth the warty digitations stand out separately one from the other.

Under a low power of the microscope (fig. 9) and in vertical section a cutaneous wart is seen to be divisible into three portions:—

A superficial layer clearly defined by the wavy line of the epithelium and containing the epidermis, with the usual dark pigment granules of native races and the dermal papillæ.

An intermediate stratum largely occupied by the growths from the sebaceous glands but also containing a few rudimentary hair follicles here and there.

A deep layer composed of the dermis and the fatty layer (this deep layer is only just visible in the photomicrograph in fig. 9).

Taking these three layers in their respective order, the epidermis is seen to consist of a well-defined stratum germinativum (fig. 5, which should be examined by means of a lens) lying upon the dermis without the intervention of any basement membrane. Superficial to this are three to five layers of prickle cells forming a well-marked stratum malpighii. These polygonal cells and their processes appear to be quite normal. Their nuclei are large, vesicular, and usually contain a well-defined nucleolus (plasmosome) and a linen network with chromatic particles. The down growths of this prickle cell layer give rise to the apparent elongation of the dermal papillæ. This proliferation is a true "acanthosis."

More superficially the epidermal cells change, becoming more flattened, while the nuclei become elongated and flattened and lose their vesicular appearance, but no granules are to be seen in this layer and therefore a definite stratum granulosum cannot be seen. In places, however, a great many granules, some free and some in cells, may be seen which may represent this layer.

On the surface of this layer lies a very highly developed stratum lucidum consisting of several layers of cells, and superficial to this is the stratum corneum, which, though poorly represented over the apices of the papillæ, is very well marked in the depressions, filling them up with a network of swollen and abnormal horny cells (hyperkeratosis

and parakeratosis) among which many cryptococci can be seen (fig. 8).

Underneath the epidermis comes the dermis, composed of rather dense fibrous tissue containing many blood vessels and spindle-shaped fibroblasts and a few leucocytes. The dermis is continued into the papillæ, which may be long and narrow or broad and short. In places the dermis is absent and directly under the epidermis lie the growths from the sebaceous glands. These growths occupy the middle layer of the specimen and are extraordinarily numerous and so closely packed together in places as to leave hardly any room for the dermal connective tissue. Generally well encapsuled in their own fibrous coat, at times their cells appear to rest directly upon the fibrous tissue of the dermis.

The germinal layer of the sebaceous growth is often well defined, but when in this condition it is usually more than one layer deep. Growths from it can be seen extending into the dermis and forming little club-shaped masses of cells, the central ones of which become typical sebaceous cells. At other places these germinal cells may be observed to be connected with the outer root sheath of a hair follicle or even with the epidermis directly. In many places they form a single layer of more or less flattened cells with vesicular nuclei.

Inside this layer of cells the sebaceous growth is mainly composed of large polyhedral cells with a highly reticulated cytoplasm, the meshes of which contain oil droplets and here and there cryptococci can be found. These cells are often completely broken down into sebaceous material. In places, however, a number of cells with dense granular protoplasm can be seen intervening between the more typical sebaceous cells and the germinal layer, but these are irregularly arranged and do not produce the normal appearance of a typical section of a sebaceous gland.

Here and there degenerate hair follicles can be seen with or without a malformed hair. In the depressions leading into the hair follicles cryptococci can be found. The deeper dermis is in the same condition as that described above. No sweat glands and no tactile or other corpuscles are to be seen. The blood vessels are very numerous and in places are markedly dilated. The lymphatic vessels are also numerous.

With regard to the lingual wart it is seen to be composed of several separate digitations which, when examined microscopically by means of a low magnification, appear to have arisen as a proliferation of the prickle cells, giving rise to downward growths which subdivide the mucosal papillæ, while at the same time it causes the outward growth of the epithelium, carrying with it the mucosal papillæ. In this way the warty digitation arises as a series of mucosal papillæ covered by a thickened epithelium (fig. 11).

The superficial layers of this thickened epithelium are seen to be composed of flattened cells, the most superficial of which are cast off from its surface. No stratum corneum, stratum lucidum or stratum granulosum can be seen, the whole epithelium being composed of nucleated, flattened or polygonal cells.

The mucosal papillæ contain congested blood vessels, and a cellular infiltration as well as the usual connective tissue.

The mucosa shows a certain amount of subepithelial cellular infiltration, as well as dilated blood and lymph vessels, but is otherwise normal.

Under high magnifications the flattened surface epithelium is seen to contain some micro-organisms of various characters, while in the deeper layers, where the cells are very vacuolated and less flattened, numerous cryptococci of various sizes, with or without buds, may be observed lying in and between the epithelial cells. Still deeper the cells assume the typical prickle-cell appearance and are seen to be resting upon the germinal layer, which has no basement membrane. In places a few leucocytes can be seen invading the epithelium. The papillæ exhibit the features already described, as does the mucosa. The cellular infiltration of the papillæ and mucosa is composed of polymorphonuclear leucocytes, lymphocytes, plasma cells, and connective tissue corpuscles.

Symptomatology.

The patient, who was a teacher in a native boys' school, and aged about 16, appeared in good health with the sole exception of an extensive warty growth which had severely injured the right eye. A peculiar sickly musty smell arising from this growth was very noticeable. He stated that it began shortly after birth, and though he could not say exactly where it commenced, he was clear as to its slow and steady growth.

When first seen (figs. 1 and 2) a considerable portion of the right side of the neck, face, ear, and side of the head was covered by a thick, mat-like growth of sessile warts, which had not merely involved the upper and lower eyelids on the right side, but had also invaded and destroyed the right eyeball. Reaching the right border of the mouth the warts had extended into the oral cavity, attacking the right side of gums, the floor of the mouth, the tongue, the right tonsil, and had grown as far posteriorly as the pharynx. The larynx, however, was not involved, neither was the naso-pharynx.

The patient's skin was naturally dark brown, but the colour of the warts, though mostly black, showed brown, green and yellow tints in places. In the mouth and pharynx this black coloration was absent and here the warts were of a fleshy tint. None of them were pedunculated, but all were sessile, painless, firm to the touch, and when handled felt greasy.

No lymphatic glands could be found to be enlarged and there were no metastases, while the general health of the patient did not appear to be in any way affected.

No recurrence was found to have occurred in the area from which warts had been removed as far back as 1910.

Diagnosis.

The leading diagnostic features are:—

(*a*) The presence of a warty growth the individual members of which are painless, firm, do not readily bleed, and do not readily ulcerate, but which tend to slowly spread and to endanger or destroy important organs.

(*b*) The proliferation of the germinal layer of the sebaceous glands in the cutaneous warts (we can well imagine a condition in which the proliferation would produce a carcinomatous and not an adenomatous appearance) with the absence of this feature in the lingual warts.

(*c*) The non-involvement of lymphatic glands, the non-formation of metastases and the non-malignancy of the growth.

(*d*) The non-recurrence after removal.

(*e*) The fact that the warts grow on healthy skin and not on cicatrices, and do not grow at first in any special relationship to mucous openings or moist areas of skin.

The differential diagnosis requires to be made from ordinary warts, from Verruca acuminata, from Botryomycotic warts, from warty cicatricial tumours (Marjolin's ulcer), from non-ulcerative leishmania nodules, from Brooke's Epithelioma adenoides cysticum; from Balzer's Adenoma sebaceum, from Blastomycotic dermatitis, from Pemphigus vegetans, from Acanthosis nigricans, and from lymphangiectodes.

From *ordinary warts* it can readily be distinguished by the history, the mat-like growth, and in the early stages, when perhaps only a single wart might be present, by its histological characters (figs. 9 and 11), and by the presence of the cryptococcus.

From *Verruca acuminata* (so-called Venereal Warts) it can be classified by not appearing isolated around mucous openings and on moist areas of skin and by its histological structure. The lingual wart shows more cellular infiltration in the papillæ and in the sub-epithelial mucosa than is present in Verruca acuminata.

From *Botryomycotic (in the tropical sense of the word) warts*, a condition met with in the Sudan, but as yet not described, it can be differentiated by the absence of any enlargement in the neighbouring lymphatic glands, and histologically (compare figs. 9, 11, and 10) by the absence of the thickened vessel walls, the dense fibrous tissue, the eosinophile fatty bodies, and by the presence of a proliferation of cells derived from the sebaceous glands in the cutaneous warts and by the cryptococci.

From *warty cicatricial tumours* it is recognized by the fact that the warts do not occur on cicatrices, are not arranged in parallel rows, do not show a tendency to ulcerate (this ulcer is sometimes called Marjolin's ulcer and is usually epitheliomatous), and do not involve the lymphatic glands.

From Balfour and Thomson's *non-ulcerative leishmania nodules* it may be diagnosed by the absence of the smooth pink coloured surface (even in the black skin), of the itching on exposure to the sun, and the pain when pressed, as well as by the different histological structure (compare figs. 9 and 12). The nodule shows many large cells with vesicular nuclei and cytoplasm full of leishmania bodies and vessels with hypertrophy of the endothelial layer. There is much proliferation of the prickle cell layer and some cell nests.

From *Brooke's Epithelioma adenoides cysticum* (synonyms: Perry's adenoma of the sweat glands; Fordyce's multiple benign epithelioma; Jarisch's hæmangio-endothelioma tuberosum multiplex, and Unna's Acanthoma adenoides cysticum) by the absence of the symmetrical arrangement, and of the small, firm, discrete tumours which can be felt to be embedded in the skin and are often so thickly clustered together as to form lumpy patches, which are at first of the colour of the skin, but later of a white bluish-yellow or pearly colour (in the white skin), and by the presence of typical warts. Histologically by the absence of solid coil-like masses of cells derived from the rete mucosum and hair follicles, and by the presence of the structure given above, but it must be noted that Pick's case showed a proliferation of the germinal epithelium of the sebaceous glands.

From Balzer's type and from Pringle's type of *Adenoma sebaceum* it may be separated by its warty condition, but Hallopeau and Leredde's type, being warty, requires further differentiation, and this can be effected by noting that the Adenoma sebaceum warts are found in the middle third of the face, especially the naso-labial folds, and by the fact that they are often accompanied by vascular nævi, by pigmented moles, and by a flat fibroma above each iliac crest. The histological characters of Adenoma sebaceum are more of the type of an epithelioma derived from the epidermis, which is certainly not the case in Murmekiasmosis.

From *Blastomycotic dermatitis* it may be separated by the absence of ulceration, of epidermal or other abscesses, and of soft, smooth scars, as well as by the presence of typical warts in contradistinction to the warty patches.

From *Pemphigus vegetans* it may be recognized by the absence of the history or the presence of bullæ on the skin and in the mouth before the appearance of the warty growths; by the absence of constitutional disturbance.

From *Acanthosis nigricans* it can be diagnosed by the absence of cutaneous roughness, of the partial symmetry of the lesions, of the cachexia, and in the white skin by the absence of bronzing.

From *Lymphangiectodes* (*Lymphangioma circumscriptum cutis*) it may be differentiated by the absence of vesicles giving rise to a warty appearance, by the presence of true warts, and histologically by the absence of dermal cysts.

Prognosis.

The warts do not appear *per se* to endanger life, but they destroy organs such as the eye, and when they enter the pharynx there is danger of the larynx becoming involved. Where removed they did not recur during a period of over four years.

Treatment.

The only effectual treatment is removal by means of a series of large dissecting operations, when the whole growth comes away like mats of warts, leaving large areas to be covered in by skin flaps and by skin grafting. Damaged organs, such as the eye in this case, must be removed.

The patient made an excellent recovery after each of his operations, though, of course, there was a considerable amount of scar tissue at the site of the growths (fig. 4). No recurrence of warts appeared on the scar.

However easy removal may be on the surface of the body it is quite another matter when the warts invade the oral cavity, the tongue, and the pharynx. In this position complete removal is quite impossible.

Prophylaxis.

The only prophylactic measure we can suggest is the prompt removal of any suspicious-looking wart, that is to say, any persistent wart dating from early years of life and any wart with a tendency to spread.

Acknowledgments.

We have much pleasure in acknowledging the kind suggestions given us from time to time by Captain Archibald, R.A.M.C., and the help we have received from our assistants, Mr. Marshall and Mr. Newlove.

Khartoum,
March 9, 1914.

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Illustrations.

Most of these illustrations may with advantage be examined by a lens.

Plate I.

Fig. 1.—Photograph giving a general view of the warty growth as seen from the front. Note invasion of the eyelids.
Fig. 2.—Photograph showing the lateral extension of the growth and the invasion of the oral cavity.
Fig. 3.—Photograph showing warts on the lips and tongue.
Fig. 4.—Photograph of the patient after the operations showing the scar tissue. Note the absence of any recurrence or of the formation of any growth on the cicatrices.

Plate II.

Fig. 5.—Photomicrograph of a vertical section of one of the warts from Murmekiasmosis Amphilaphes. × 70 diameters.
Fig. 6.—(*a*) Photomicrograph of *Cryptococcus myrmeciæ*, stained by Giemsa's method, as seen in a film made from a scraping of the central portion of a vertical section of a freshly removed wart from the case of Murmekiasmosis Amphilaphes. × 1,500 diameters.
(*b*) Photomicrograph of *Cryptococcus myrmeciæ*, a similar film stained by Leishman's method. × 1,500 diameters.
(*c*) Photomicrograph of *Cryptococcus myrmeciæ*, stained by Leishman's method, as seen in a film made from a scraping of a digitation of one of the lingual warts from the case of Murmekiasmosis Amphilaphes. × 1,400 diameters.
Fig. 7.—Photomicrograph of a section through a sebaceous gland from Murmekiasmosis Amphilaphes showing *Cryptococcus myrmeciæ* deeply embedded in the cytoplasm of a cell. × 1,500 diameters.
Fig. 8.—Photomicrograph showing *Cryptococcus myrmeciæ* lying in the cells of the hypertrophied stratum corneum filling in the hollows between two papillæ. Note budding and non-budding forms. Stained by Gram's method. × 1,300 diameters.

Plate III.

Fig. 9.—The same photomicrograph as fig. 5, but only magnified by 30 diameters.
Fig. 10.—Photomicrograph of a botryomycotic wart in the Sudan. × 35 diameters.
Fig. 11.—Photomicrograph of vertical section of a wart from the tongue in Murmekiasmosis Amphilaphes. × 30 diameters.
Fig. 12.—Photomicrograph of a non-ulcerative Leishmania nodule in the Sudan. × 30 diameters.

The Geranium as a means of excluding Flies.—It is reported that the presence of geranium (pelargonium) plants serves to prevent flies congregating in a room. It appears that it does not matter whether the geranium is of the scented variety or not. It is a trite observation and one which serves to explain the usefulness of plants in a room and the craze there is for loading a sick room with cut flowers. That the cut flowers can have much virtue either as an insect or germ protector is perhaps dubious, but that the cut flowers amongst city folks are representative of plants growing in pots in country houses and in villages there can be no doubt. The custom of having plants in the window may be hereby explained.

A Disease of Rice.—Dr. E. J. Butler, in the annual report of the Board of Scientific Advice for India for 1912-13, gives an account of a disease of inundated rice which has broken out in the deltaic districts of Eastern Bengal. Locally it is known as *ufra*. Investigation has shown that it is caused by a minute parasitic nematode worm of the genus *Tylenchus*. The parasite, which has not hitherto been described, attacks especially the deep-water winter rice, and the damage done by it is so serious that frequently the affected fields are not considered worth harvesting. The disease seems to be spreading. The parasite appears to be entirely restricted to rice. The apex of the shoot, the young leaves, and the young ear are the parts most open to attack. It passes the period between successive crops coiled up, in a resting condition, in the stubble, and can stand drying in this state for over a year.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 1, 1914.

ARE PLANTS, TREES, AND FLOWERS IN AND AROUND OUR HOUSES BENEFICIAL OR DELETERIOUS?

IN the public press in England there is at the present time considerable interest being taken concerning the effect of plants and flowers in causing peculiar and, in many instances, quite specific symptoms in many people. The plane trees so plentifully seen in London streets and parks are considered by some contributors to the press as being the cause of a peculiar irritation of the air passages; the rose is accused of causing "rose fever"; lilies of a particular kind are excluded from dwelling rooms, as they are believed to bring about a state of faintness and a disturbance of the circulation. A long list of similar accusations against plants and flowers might be enumerated until one marvels that not only are flowering plants tolerated in our dwelling rooms, but even in proximity to our dwellings at all. The inscrutability of the phenomena of "hay fever" is immediately suggested by these observations, and it would seem time that some serious attention was paid to the question of the part played by plants and flowers in domestic economy.

The custom of loading our hospital wards, our nursing homes, and the sick room in our dwellings with flowers has become so prevalent that one feels rather ashamed to pay a visit to a friend or relation in any one of these without bringing some flowers to present to the patient and to "decorate" the room. The custom seems to be universal and to have continued from the earliest times. The reason for this fashion of "helping" our fellow-beings in their illnesses is not so easily explained as it might appear. The custom is so deeply rooted that it cannot be due to mere courtesy, to an act of kindness, or to bringing something pleasant for the patient to look at. None of our so-called decorations were introduced for merely decorative purposes. The curtains to our windows were meant when first used to keep away flies and other pests; our mantelpieces and the niches in our walls, overmantels, cabinets, &c., were intended as convenient places to store the household gods, and when these became too numerous a higher shelf or frieze was run round some little distance below the ceiling to accommodate the surplus. The gardens around our houses, so beloved of all mankind, had originally a utilitarian purpose, and so, no doubt, had the plants and cut flowers in our dwellings. What purpose do these, or rather, did these serve, for there is no doubt we have wandered away from the utilitarian ideas of the past and reached the stage when mere decoration is all that is thought of? The bases of all customs of the kind that survive had protection against disease and the maintenance of health as their primary object, and although no doubt decoration of the dwelling-house has a hygienic influence, its direct bearing is not so obvious.

Although the scientific explanation of the part played by insects in the spread of disease is the theme of to-day, the belief in their power to spread disease has been acted on from time immemorial. The destruction insects—using the term in the wide sense—cause to the woodwork of the house, to clothing, to food, and to almost everything connected with our health, comfort, and dwellings has caused man to wage a constant fight against these destructive pests.

The box on the window-sills of our rooms filled with plants is beloved of all classes of people, and is found in the palace and the cottage. In the cottage the plant esteemed above all others is the geranium, although mignonette is a lusty rival. This collection of flowers in our windows was not put there for mere decoration, but as a screen to exclude flies and insects of all kinds, and the plants

chosen were those that by some effluvia or other virtue were repulsive to these pests. The geranium is a plant of this nature, for insects systematically avoid it; the choice of the geranium cannot be a coincidence surely, for many plants are prettier, many smell more sweetly, and in the matter of flower it seems a negligible quantity, for it is not always the flowering geranium that is chosen.

Whilst some flowers are chosen for their inherent quality of repelling insects, others have the power of attracting them; these are never placed in our rooms, but in the garden. The garden trees and plants were also chosen for utilitarian purposes, some for their edible qualities, such as fruit and vegetables, some, as flowering plants, as food for bees, and several for their medicinal properties. Of the latter chamomile was grown by our grandmothers, and is still cultivated for the purpose of flavouring more especially that ill-tasting salts and senna compound so frequently in use. Valerian, marsh-mallow, rhubarb, and many other plants with real or assumed medicinal virtues grew in all gardens up to recent years, but they have been gradually displaced, and the chemist's products have replaced the home-grown "simples," and not even our kitchen gardens contain them. Decorative annuals, the sweet pea, and hybrid products of the greenhouse have largely replaced the useful plants, and gardens have become divided into two classes: the purely decorative and the kitchen garden. Of the latter we seem rather ashamed, for it is hidden away behind high hedges, or even removed at a distance from the house. All these changes are interesting, and point to an evolution which no doubt is consistent with necessity.

The original dwelling of mankind was at a homestead with adjacent farm buildings for the accommodation of cattle; but the presence of cattle meant an adjacent midden, sometimes the manure was heaped up against the house or placed within a few yards of the dwelling-house, oftentimes the door opened on to a pathway which passed through the centre of the midden. The manure heap was a breeding-place for flies, and its effluvia was at times objectionable. To keep out the flies plants repulsive to them were placed in the window-sill, and strong-smelling plants, such as musk or mignonette, were made use of to overcome the stench of the midden. The dried rose leaves kept in an open bowl scented the guests' rooms for the same purpose, and on every hand we find that the original idea of flowers and plants in and around our dwellings were intended to prevent or cure disease or to act as deodorants to overcome the foul odour inseparable from the proximity of animals. Many other considerations arise in connection with this subject. Is it hygienic to have vegetation near our dwellings at all? Modern teaching would seem to denounce their presence. It is only by cutting down the trees, undergrowth, and even the rank grass for some two hundred yards around our dwellings that mosquitoes, and thereby malaria, can be radically prevented; this raises the whole question of the hygienic influence of plants, flowers, and trees, whether it be the cut flowers in our sick rooms, the plants in pots in our windows, the ivy on the walls, the roses peeping in at the cottage casement, or the garden, whether flower or vegetable, adjacent to our dwellings. Man is pictured in the Bible as having originally dwelt in a garden, but the influence of that environment had evidently an evil effect morally, and it may have been for his moral and physical welfare that he was compelled to leave it.

J. C.

Annotations.

Experiments concerning the Filterability of Spirochæta duttoni (J. L. Todd and S. B. Wolbach, *Journal of Medical Research*, March, 1914) have shown that *S. duttoni* can be filtered through even the least permeable of Berkefeld filters by means of a pressure of from 50 to 90 lb. to the square inch; and that an infective form of *S. duttoni* could not be filtered by the force supplied by atmospheric pressure.

The Nature of the Kurloff Body.—In the *Indian Journal of Medical Research* for January, 1914, Acton and Knowles have a further paper "On the Nature of the Kurloff Body." In 1898 Kurloff first drew attention to the fact that the mononuclear leucocytes of the guinea-pig contained large spherical bodies of the nature of cell-inclusions. He considered these bodies to be vacuoles containing secretory products. Ehrlich, in 1908, expressed a similar opinion as to their nature. E. H. Ross, in 1912, described Kurloff's bodies as parasites (lymphocytozoa) inhabiting the mononuclear leucocytes. They eventually give rise to spirochætes which escape into the blood plasma. In the present paper the authors point out that the body is nothing more than a stage in the development of the eosinophile leucocyte. Material is given off as a granule from the nucleolus of the nucleus. It escapes into the cytoplasm, and there increases greatly in size and eventually contains a long coiled thread which segments into a large number of granules which become the eosinophile granules when distributed through the cytoplasm. The various stages in this developmental process are illustrated by an excellant plate. Kurloff's bodies, moreover, are not peculiar to guinea-pigs, but occur in the bone marrow of widely different animals, birds, amphibia, and mammals. Normally, the development of the eosinophile granules takes place only in the bone marrow, but under the influence of helminthic infections the Kurloff bodies being immature eosinophile leucocytes appear in the peripheral blood.

The Distribution and Morphology of Spirochæta duttoni *and* S. kochi *in experimentally infected Ticks* (Ornithodorus moubata).—As a result of their investigations the authors support the conclusions of Marchoux and Couvy, that the granules in the epithelial structures of the tick are not concerned with the life cycle of the spirochæte. These granules are abundant in epithelial structures of non-infective ticks,

in which spirochætes could not be demonstrated, and further, spirochætes do not invade epithelial cells for purposes of multiplication. The only type of tissue in which spirochætes were found in sufficient abundance to warrant the assumption of multiplication having occurred, was that of the connective tissue type. Tissues of this type are the fibro-muscular layers of the gut, the peritracheal fat tissue, and the delicate strands of connective tissue uniting the organs of the tick. The power of the spirochæte to migrate through the tissues explains the invasion of all the organs. It seems probable that infection may be conveyed by a variety of channels. The finding of spirochætes in the lumen and cells of the salivary glands, in the coxal glands, and in the wall of the gut proves the possibility of infection by any of these routes. No evidence has been obtained which supports the infective nature of the granules derived from the ticks. Certain larger granules are derived from spirochætes, but they are quite different from the "infective" granules of Leishman, Balfour and others. The transmission of infection for the period of time studied does not need the assumption of any other form than spirochætes. The evidence that the granules and granule clusters are a stage in the life-history of the spirochætes is purely morphological. These observations were conducted on sections of the organs of ticks removed from the chitinous covering *en masse* and stained by a modification of the Giemsa method which demonstrates the spirochætes in tissues very clearly.

The Cultivation of a Free-living Filterable Spirochæte (Spirochæta elusa ; *new species*).—A preliminary report, by S. B. Wolbach and C. S. L. Binger (*Journal of Medical Research*, March, 1914). Water from Jamaica Pond, Boston, after being filtered through a Berkefeld "V" filter, was found about one month later to contain a spirochæte in culture. After much experimentation it was found that the organism would grow in a hay medium prepared as follows: 120 gr. of hay are soaked in one litre of water for half an hour. To the decanted water is added 1 per cent. dextrose. The medium is rendered neutral to phenolphthalein and is then sterilized by filtration through the Chamberland "F" filter and tubed. The reaction of the hay infusion is then about ·2 per cent. acid to phenolphthalein. A solid medium was also prepared by mixing equal parts of 3 per cent. agar and the hay dextrose medium. The mixing is better done when the agar has cooled to 50° C.

The liquid medium is heavily clouded by growth in forty-eight hours, and with these cultures it has been demonstrated that the organism is able to pass through Berkefeld "V," "N," and "W" filters, but not through Chamberland "F" and "B" filters.

In culture the optimum temperature is 30° C. Growth occurs in colonies on the surface of the agar or in stab cultures. Morphologically the spirochæte resembles closely the pathogenic spirochætes, but with it it has been found impossible to infect animals.

Abstracts.

THE OPERATIVE TREATMENT OF HEPATIC ABSCESS.*

By E. A. R. Newman, M.D.Cantab.

This paper is chiefly based on a series of 29 cases which have been admitted under my care during the past eighteen months, with a provisional diagnosis of hepatic abscess. Of these 29 cases, 2 proved to be instances of sub-phrenic abscess entirely unconnected with the liver. One was a large right empyema displacing the organ downwards, and another was a breaking down gumma in a female, which was diagnosed from her past history and which cleared up quickly under iodides. The case was interesting as it presented all the physical appearances of a localized abscess pointing in the eighth intercostal space. Excluding these, 25 cases of true hepatic abscess remain.

Of these 25 cases all but 2 were operated on. Of these one was admitted in a moribund state and died in a few hours, and in the other the abscess was already discharging through the lung, and he left hospital at his own request a few days later.

Of these 23 cases, 15 were discharged cured after an average stay of thirty-five to forty days in hospital and 8 died. The case mortality is therefore 35, or one in three cases. This mortality is an expression of the extremely advanced and neglected condition of these cases on admission; the majority were prostrated, some extremely so.

Cause and date of death are given in the following table:—

2	died within 24 hours,	aged 50 and 35,	from shock and hyperpyrexia respectively.
1	died on 5th day,	aged 45,	from shock and exhaustion.
1	,, 6th ,,	,, 40	,, ,, ,,
1	,, 10th	,, 30	,, complete right lobar pneumonia.
1	,, 12th ,,	,, 52	,, exhaustion.
1	,, 18th ,,	,, 45	,, ,, (2 operations).
1	,, 42nd day,	aged 28,	from sepsis.

Exhaustion was thus the commonest cause of death, complicated by shock in 3 if not 4 cases. Sepsis was definitely the cause of death in one case only. The death due to lobar pneumonia cannot be directly ascribed to the local condition, which was steadily improving, but must in strict fairness be included. The one striking fact, which might have been anticipated, is that 5 deaths out of the total occurred in patients aged over 40.

Topographically, a trans-thoracic incision was made in 8 cases, and an epigastric or abdominal incision in 12 cases. In one instance an incision was made at two distinct operations, and in two I could find no record in the notes. In one case treated by trans-thoracic incision no adhesions existed, and partial resection of a rib or cartilage was only per-

* From the *Indian Medical Gazette*, March, 1914.

formed three times; in two cases treated by epigastric incision no parietal adhesions existed.

Symptoms and Diagnosis.—Late or advanced cases present less difficulty in diagnosis than incipient or intermediate ones, the local appearances pointing conclusively to the existence of pus, though it may not always be easy to be sure of its exact situation. The great majority of my cases were of this class. The only points worthy of note are: (1) That the temperature on admission is often subnormal and rarely above 100° F., and (2) that jaundice is usually absent, or if present does not amount to more than a faint icteric tinge of the conjunctivæ. The treatment adopted may be summarized in four words—free incision and drainage, combined, of course, with emetine hypodermically. Incipient and intermediate cases present the greatest difficulty in diagnosis and consequently in treatment. Again I do not propose to consider the differential diagnosis, but I would lay stress on two points: (1) Repeated careful local examinations for any œdema of the integument *no matter how slight*, and (2) a leucocyte count. Of jaundice my experience is that it is usually absent or very slight. If jaundice is definitely present it is a positive contra-indication of the probability of a true abscess of the organ and is an indication of inflammation about the biliary tract. Two cases in point: both were suffering from enlargement of the liver and marked jaundice, and in both pus was found in small quantity only by aspiration. In one of them an autopsy revealed the presence of multiple small abscesses of pyæmic nature.

Treatment.— Emetine hypodermically, of course, which may settle the diagnosis by effecting a cure. Locally leeches may be advantageously applied according to the patient's circumstances. Counter-irritants, including iodine, are as certainly contra-indicated, as they will produce œdema and redness of the skin and obscure the local condition.

I now come to the crux of the whole question, viz., *the diagnostic use of the aspirator.*

The circumstances under which I am considering its use must be borne in mind. There is pain, tenderness, and enlargement of the liver. There is a slight to a well-marked leucocytosis. There is no definite œdema of the integuments. Are we justified in immediate aspiration for the purpose of making a diagnosis?

A few years ago I should have answered this question in the affirmative. With further experience I should qualify this considerably.

I am convinced that the aspirator has been a much misused instrument, and since the perfection of an aseptic technique, the occasions for its use are becoming increasingly rarer. The chief danger of aspiration is, of course, internal hæmorrhage. Some fourteen years ago I lost a patient after exploratory puncture of a much enlarged liver. Two hours after the operation he suddenly became collapsed and died in less than an hour. The autopsy confirmed what was already only too obvious, and I had not even the mitigation of finding an abscess. On talking this case over with a colleague he cited a similar experience, and told me he had also heard of another within a short time. We have all heard of these cases, but it is obvious that the majority find no permanent record. The only safe conclusion for guidance in practice is that the danger of internal hæmorrhage after exploratory puncture of the liver is greater than authority would lead us to suppose. A further argument against the use of the aspirator in my experience is its unreliability. I have more than once extracted sufficient pus to induce me to cut down on the organ only to find an insignificant cavity. Per contra, I have also failed to extract pus when it was present in large quantity. I do not mean I have missed the abscess cavity, though this is always a possibility, but that I have actually failed to aspirate pus through the cannula inserted into the abscess. Case No. 3 of my series was a striking instance in point. Aspiration trans-thoracically revealed pus and a small abscess was opened and drained. At the same sitting the left lobe which was much enlarged was punctured and aspirated in two places through the epigastrium, without effect. The patient was but little better for these measures, and five days later I again aspirated the left lobe without effect. This time I was not deterred by the negative result, but cut down and drained a large abscess full of typical liver pus. The patient died on the thirteenth day after the second operation, and I regret that I relied too much on the aspirator and too little on my clinical observation. This is by no means a solitary experience, and such instances have led me to regard the aspirator as an aid to diagnosis with great distrust.

Another danger is an anatomical one. I refer to the risk of exploratory puncture through the abdominal wall in the epigastric or hypochondriac regions. The danger of puncturing other hollow viscera is not great if the puncture is strictly confined to the limits of a definite swelling. But abscesses in these regions may originate in the gall-bladder or be confined to the lesser omental cavity as the result of duodenal or gastric perforation. Or, further, a true hepatic abscess may exist on the under surface of the organ at some distance from the surface, and, of course, without the existence of parietal adhesions. In the absence of adhesions the pus, under considerable pressure, may leak alongside the cannula, or through the puncture wound when withdrawn, and there is a definite risk of infecting the peritoneum. The presence of the cannula is further a hindrance to a clean incision, and when the parietes are divided the difficulty of packing off the general peritoneal cavity with pus oozing from the abscess is considerably enhanced.

If, on the other hand, the abdominal wall is incised, with a sand bag placed under the loins, and no adhesions are found to exist, an excellent and uninterrupted field of operation is obtained. Preliminary packing is carried out with precision and certainty, and the abscess is evacuated and drained with comparative ease. Supposing no abscess of any kind is found the exploratory incision can be closed without danger or risk to the patient, and much valuable diagnostic information may be obtained.

Two cases out of 27 proved on incision to be subphrenic abscesses. The second case presented himself at the Out-patient Department, complaining of severe epigastric pain. Nothing more was seen of him for one month, when he came up looking very ill and emaciated, with a tense, bulging swelling in the epigastric region and the liver palpable for two fingers'-breadth below the costal margin, continuous with the swelling. It looked exactly like a typical abscess of the left lobe, but the event proved that the collection of pus was entirely distinct from the liver. As extensive parietal adhesions were present, the aspirator would have done no harm, but would not have been of the slightest assistance.

Three other cases well illustrate the possible dangers of indiscriminate epigastric puncture; in none of these cases did parietal adhesions exist. In one case the patient, an elderly man, appeared to be suffering from hepatic abscess. The organ was enlarged and the margin palpable for two or three fingers'-breadth below the costal margin, while there was an indefinite boggy swelling in the epigastrium. There was no œdema of the integuments. As the physical signs were not very definite, I cut down through the right rectus instead of using the aspirator, and, finding no parietal adhesions, opened the abdominal cavity. A digital examination revealed the free healthy margin of the right lobe, and some 2 in. away from it the commencement of an abscess sac subimposed on the under surface of the organ. While performing an autopsy some years ago I met with an almost exactly similar case of a sub-hepatic abscess unrecognized during life, and wondered at the time how such a case would be dealt with in actual practice. When confronted with a similar state of affairs in the case recounted, the peritoneal cavity was packed off with gauze with some little difficulty on account of the depth, and the abscess opened by Hilton's method. A drainage tube was inserted and the soiled pack replaced by a clean one, which was removed on the third day. An uninterrupted convalescence followed.

Now in both these instances the abscess could only have been aspirated by traversing not less than 3 in. in thickness of healthy liver in addition to the abdominal wall, and I have grave doubts if it could have been reached at all. Supposing it had been, the danger of hæmorrhage in the first place, and of pushing the drainage tube through the thin abscess wall in the second, and so infecting the general peritoneal cavity, would have been considerable. These cases have convinced me that the use of the aspirator is contra-indicated if the abdominal wall has to be traversed, unless the parietes are obviously adherent. In the case of exploratory puncture through the thoracic wall the anatomical conditions are different. Here there is no question of the possibility of puncturing any other organ but the liver. Further, by reason of the unyielding character of the thoracic wall, incision has no advantage over puncture from a diagnostic point of view while it has obvious disadvantages.

Objections to the Diagnostic Use of the Aspirator:—

(1) Danger of internal hæmorrhage.

(2) Unreliability.

(3) The obscuration of the field of operation by pus if no adhesions exist.

(4) The danger of an intraperitoneal leak, if no adhesions exist, when passed through the abdominal wall.

Having thus reviewed its limitations I may formulate rules for guidance in its use for diagnostic purposes only.

(1) The aspirator, as a means of diagnosis of hepatic abscess, should never be employed until all other diagnostic methods have been fully tried and have failed; they include repeated careful local examinations, a leucocyte count, and emetine hypodermically.

(2) Its use is only justifiable then on the conditions that (*a*) the patient has been prepared by the administration of calcium salts in full doses for twenty-four hours beforehand; (*b*) that the puncture is only made through the thoracic wall and never through the abdominal parietes unless they are obviously adherent; and (*c*) that preparations have been made beforehand to incise and drain the abscess at the same sitting, in the event of pus in any quantity being found. This condition applies with even greater force to exploration and aspiration of the pleural cavity.

(3) After its use with negative results a firm body roller must be applied and the patient kept as quiet as possible, while the administration of calcium salts is continued for twenty-four hours longer.

The Use of the Aspirator as a Therapeutic Agent.—On its introduction, many years ago, the dangers of general and local infections consequent upon an open operation were imminent and real, but with the strides made in aseptic technique this is no longer the case. To advocate its continued use on the former grounds appears to me to largely overlook the radical changes in the conditions under which modern surgery is practised. But to advocate its use on the grounds that infection from the atmosphere, or secondary aerial infection, is an imminent danger following incision and drainage, is to wholly disregard the classical experiments of Tyndall and others, which were accepted by Lister himself twenty-five years ago, and strikes at the root of aseptic surgery as it is now practised. Secondary aerial infection is a chimera, and everyday experience proves that it is so.

There is no denying the possibility of secondary infection after incision and drainage, but when it does occur it is either due to direct infection from the skin or to infection conveyed by the hands, instruments, or dressings, &c., and is consequently largely preventible. There is far greater danger in the continuous drainage of an hepatic abscess by a comparatively small cannula than by a free incision. With a small localized, and consequently quiescent, abscess to deal with, it matters little what you do. Relieve the pus tension and Nature will do the rest. Such cases are certainly the exception in native hospital practice. When there is pus in any quantity in the liver the proper procedure is still to cut down and

drain the abscess freely, with strict aseptic precautions of course.

The Operation.—(1) Cut down over the most prominent part of the swelling; if the skin is not actually inflamed it will often be found œdematous. In the absence of such localizing signs, ascertain the most tender point and make the incision over it. The skin incision should never be less than 3 in., and should be parallel to the rectus in the epigastric region, to the costal margins in the hypochondriac region, and to the ribs in the thoracic region. The muscles should be split and not divided with the knife.

(2) If adhesions do not appear to exist, cautiously explore with the forefinger, but on no account break down any there may be. If none exist, pack the space between the organ and the parietes with a strip or two of plain gauze, leaving an elliptical area about 1½ in. in its long diameter.

(3) On no account explore the liver with the knife, but plunge a pair of Lister's forceps into it with a boring motion by Hilton's method. If the capsule offers great resistance it may be punctured, and the forceps then inserted.

(4) After the excess of pus has drained away, insert two good sized rubber drainage-tubes eyeletted at intervals, lumen ⅜ in. in diameter. One should extend to the full depth of the cavity, the other may be shorter to act as an air vent. Transfix each with a separate safety pin placed at right angles to the wound.

(5) Next evacuate as much residual pus as possible with Bier's suction cup, or by turning the patient on to his face.

(6) Reduce the size of the skin incision by one or more silkworm gut satures suitably placed, and pack round the tubes with gauze.

Anæsthesia.—In very prostrate cases with large abscesses the rapid induction of shock under chloroform is striking, and in eight out of my last nine cases I discarded general in favour of local anæsthesia. I use P. D. & Co.'s eudrenine, 1 c.c. or an ordinary hypodermic syringeful, and dilute it with five or six syringefuls of sterile saline and inject the whole quantity. In one case following Crile, I used a solution of quinine and urea hydrochloride for the deeper parts, as the anæsthesia lasts longer. The absence of hæmorrhage at the time bespeaks care in hæmostasis, or recurrent hæmorrhage may occur later. All obvious vessels must be clipped and ligatured. An incidental advantage of local anæsthesia is that there is no need for haste.

If a rib has to be resected a general anæsthetic must be given, and speed is an important factor under these conditions. A good pair of rib shears is much to be preferred to a saw and bone-cutting forceps. Rib resection, which is advocated as a routine measure when the thoracic wall is traversed, is in my experience comparatively rarely necessary, three times in eight cases; and I am satisfied it is better avoided when possible and held in reserve for special cases. There is usually ample room for two medium sized drainage tubes in the eighth or ninth intercostal spaces in the mid-axillary line, and the incision can usually be placed here.

When parietal adhesions are absent (pleural or peritoneal), the practice of suturing the serous layers before opening the abscess is extremely unpractical. It is always difficult, sometimes insuperably so. It takes much valuable time, and even when successfully performed the stitches are very likely to cut out with the alteration of the relative position of the parts coincident upon the opening of the abscess. Gauze packing is the proper method to adopt; not only can it be rapidly performed, but it adapts itself automatically to alterations of position and is, therefore, much more reliable.

Drainage.—Two tubes should always be used if possible. With two tubes and due attention to posture after operation, there should not be the smallest difficulty in securing free and uninterrupted drainage through an anterior or a lateral wound. I am not a believer in counter-openings posteriorly. It increases the severity of the operation enormously. I have seen cases with tubes sticking out of them in three or four situations. The scars left are often very painful. Such a state of affairs appears to me to be a confession of failure to secure proper drainage at the primary operation. Secondary sepsis, too, may be responsible for later counter-openings—a confession of failure in another direction. Suction with Bier's apparatus is a great help nowadays, but posture and the use of the double drainage tubes are our sheet-anchors.

Strict asepsis is, of course, absolutely essential, both at the time of operation and during the after-treatment. The superficial dressings must be changed frequently at first, and later irrigation with a weak iodine lotion promotes healing. Bismuth paste or gauze packing will shorten the closure of subsequent sinuses. Emetine hypodermically should always be given as a routine measure.

TREATMENT OF LIVER ABSCESS.*

By John D. Sandes, I.M.S.
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Thirty-two cases of liver abscess were operated on in the last twelve months. The statistics are somewhat misleading, as they seem to show that opening and drainage is a more successful method of treatment than simple aspiration. All the most serious cases were treated, in the first instance at least, by aspiration—indeed, the condition of many of them would not allow of any more prolonged interference. Those treated by incision and drainage include all the cases of abscess of the left lobe, which class of abscess, as a rule, is smaller and less serious than abscess of the right lobe; twenty-one cases were treated by aspiration alone, and of these six died. This seems a high proportion of deaths, and so it is, but when we consider the conditions under which many of these cases were done and the extent of the mischief, I do not think the mortality at all great. A majority of my cases are operations of emergency.

* From the *Indian Medical Gazette*, March, 1914.

done at all hours of the day and night immediately on arrival of the patient. Many of the cases are in an emaciated and some in a moribund condition, and it is almost questionable if any operative interference at all is justifiable in some, even although one is quite aware that there is a liver full of pus waiting to be tapped. I have, however, always aspirated these cases, however bad, as it gives the only chance of recovery. Aspiration alone is permissible in these cases, and this no doubt swells the mortality of the cases under this heading. All the cases of large right lobed abscesses in which there was no definite pointing were also treated by this method. Again, under this heading are included those cases in which the abscess had burst into the pleura. Many of the cases required more than one aspiration—one or two as many as four—as in Case 19 of my series, in which 90 oz., 48 oz., 40 oz., and 36 oz. were respectively drawn off at four successive aspirations and recovery followed. Case 29 was the biggest abscess I have ever seen; at the first operation 126 oz. of pus were aspirated, and a few days later another 40 oz. The patient was in an extremely low condition from the start and finally died. Of those that died, it is often noted in the notes that they are "weak and emaciated," and there is little doubt that a fatal result would have ensued no matter what treatment was adopted. A solution of quinine of strength 10 gr. to the 1 oz. water was injected into the liver cavity after aspiration in a number of the cases, and before the emetine treatment was adopted as routine, was an important method of treatment, and especially valuable in those abscesses of medium size containing about 20 or 30 oz. of pus. In these cases one aspiration followed by quinine injections often effected a cure. During the procedure of aspiration it is noticeable that the pus flows steadily out through the aspiration needle until the majority of it has been removed, then it comes more slowly in thick drops, and finally there is often left a few ounces of thick residual pus that defies extraction by the aspirator. For these cases I adopt the very useful procedure of forcible aspiration by means of a strong metal syringe. The syringe is connected with the aspirating needle by means of a short stout piece of rubber tubing, and by exercising forcible suction as much as 10 or 15 oz. of very thick ropy pus can often be withdrawn in addition to what has been taken off by the aspirator. There is perhaps a slight tendency for this forcible aspiration to cause some hæmorrhage, and if much blood enters the syringe the procedure must, of course, be given up, but in my own experience I have never come across a case that has given rise to any anxiety in this way. I consider this is a most useful subsidiary method of treatment, and I also think that it is in these cases that the injection of quinine is most useful. Very large abscesses almost always need a second and even a third aspiration, and I do not think these injections of quinine have as much effect in these cases until the second or third occasion, when the abscess cavity has contracted down considerably. The point of aspiration depends, of course, upon the position of the abscess, but in the many cases in which there is no actual pointing, but only general enlargement of the right lobe of the liver, I have found the posterior axillary line as high up as possible and consistent with safety to be the most satisfactory place. There is a tendency for right lobed abscesses, which form the large majority of all cases, to bulge downwards towards the abdominal cavity, and if these are aspirated too near the costal margin, there is a tendency as the aspiration proceeds for the abscess to retreat upwards towards the diaphragm, and the needle thus becomes tilted and at times obstructed. If pus is not reached at the first puncture, it should be repeated, and if necessary many punctures in various directions made. General anæsthetics are better avoided, if possible. I have done the large majority of my aspirations under local anæsthesia, and I have no doubt that in those grave cases of large right lobed abscess it has helped to bring about a successful termination of some of the cases. If ethyl chloride is used to freeze the skin and a slight notch then made with a knife, the procedure of aspiration is, to all intents and purposes, painless; certainly no more painful than tapping an ascites for which nobody ever thinks of giving a general anæsthetic. I have, to a large extent, given up the injection of quinine into the abscess cavity, as I believe it is unnecessary now that we have emetine at our disposal. The usual procedure is now, after aspiration, to give an injection of ½ gr. or 1 gr. on the table (hypodermically), this dose being repeated daily for six days. This single daily injection is better than a smaller dose morning and evening, as the latter, on account of the number of punctures, tends to cause soreness of the skin.

Six cases were treated by incision and drainage with one death. Most of these cases were small left lobe abscesses, some were pointing abscesses without any very marked enlargement of the liver, in which it was often difficult to say whether they were liver abscesses or merely superficial parietal abscesses. In either of the above cases aspiration is not a suitable procedure. The incision is made over the pointing portion, and when pus is reached a finger is inserted and the abscess cavity explored. Drainage tubes are inserted, and the pus encouraged to drain into pads of sterile wool. The difficulty is to keep these cases free from pyogenic contamination. A general anæsthetic is necessary in these cases, and thus a new danger added that can be avoided in the method by aspiration. About 30 oz. of pus is the largest amount I have evacuated by this means.

Finally, four cases were treated by aspiration, followed at a later date by incision. All of these recovered. This method of treatment is a most useful one as a certain number—luckily not very many—fill up rapidly even after repeated aspiration. The patients often improve much after aspiration, and by the time incision and drainage is performed are in a better condition to bear the operation. I have no doubt this continual drainage is necessary in some cases, and it has its particular use in those cases of large abscess which have been improved, but not cured, by aspiration.

In conclusion, then, aspiration is the method of choice, and should always be attempted even in apparently desperate cases. The puncture should be made in the posterior axillary line as high up as possible. No general anæsthetic should be given, and 1 gr. of emetine should be injected hypodermically while the patient is in the theatre. Incision and drainage should be performed for the abscesses of the left lobe, and abscesses that are pointing, particularly if there is no great general enlargement of the liver. Free drainage by large rubber tubes should be provided. A combination of these methods is indicated when aspiration has not effected a cure.

Reviews.

DEFENSIVE FERMENTS OF THE ANIMAL ORGANISM. By Emil Abderhalden. Translated by J. O. Gavronsky and M. F. Lanchester. Pp. xx + 242. London: John Bale, Sons and Danielsson, Ltd., 1914. Price 7s. 6d. net.

An English translation of the Third Edition of the work of this distinguished German physiologist is most welcome, considering the large number of articles that appear in English and American journals in which his methods are discussed.

Although Abderhalden's technique for the detection of pregnancy is the best known, in the same way that the Wassermann test is the most frequently used form of complement fixation, his lines of investigation are both numerous and of extreme promise. These new methods of research for testing the function of organs and the differential diagnoses of various diseases by essentially physiological methods are mainly of physiological interest, their performance being vastly more elaborate than the Wassermann test. The defensive ferment reaction localizes, as far as possible, the diseased parts and often also the character of the lesion. It is of use in investigating the dystrophic lesion of the genital glands in dementia præcox, epilepsy and other mental conditions; diseases of the blood, as pernicious anæmia, may also be usefully investigated. Joint diseases, as gout, rheumatism and rheumatoid arthritis, may be traced to their primary causation.

German books and translations are proverbially difficult to understand, and, in this instance, several hours' deep concentration and study will be required before the reader is able to thoroughly appreciate and reap the benefit of this line of investigation, but the labour will be amply repaid. In the past medicine has received many benefits from physiological studies, and in the future the line in question bids fair to confer great benefits on practical medicine. For this end to be attained, it is only fair that clinical workers should inform themselves of it and put themselves in a position to co-operate with physiologists.

Several of the terms used are given in a new sense, as the words "fundaments" and "substrate," "harmony" and "disharmony," which are not capable of literal translation.

There is a very full table of contents, and the pages are headed with indications of the subject matter—a boon far too frequently absent from English publications.

The methods consist, first, of the dialysation process, and, secondly, of the optical method requiring elaborate apparatus.

Embracing, as the work does, the borderland of physiology and medicine, the book is of equal importance and interest to both.

SANITATION IN INDIA. By J. A. Turner, M.D., D.P.H., with contributions by others. Pp. 1014. Bombay: *Times of India* Press, 1914.

Although the title of the book is "Sanitation in India," a second title might well be "Tropical Sanitation," as all subjects relating to hygiene of the Tropics are dealt with. The practical application and principles of sanitation are gone into very thoroughly.

The subject is so arranged as to facilitate reference to the matters dealt with, and the various types used for headings are a great help to the reader.

After a comparison of the sanitary administration in England and India, the circumstances connected with cities and ports are then dealt with. Collection, removal and disposal of town refuse are followed by consideration of sewage matters; the important subject of water, such as sources, hardness, storage, distribution, examination, composition. The consideration of food and milk has particular attention paid to it, especially as regards the parasites in water, meat, fish and other food-stuffs. The parasitic diseases of animals, as well as the bacteria of milk and the preservation of meat, milk and vegetables by various methods, are described and explained.

An especial feature of the book is the attention paid to all the minute details connected with the prevention of tropical diseases.

Although considerable space is devoted to the description of cholera, plague and typhoid, subjects which are apt to escape the notice of the student at home receive due attention. For example, the housefly, its habits, life history and means of extermination are so interestingly discussed that the reader can imagine that he hears the buzzing of their wings, and feels inclined to consign them to their traditional father.

With regard to malaria and mosquitoes, of which everyone in the Tropics reads so much, the subject is condensed into a clear account occupying a little over sixty pages.

Native habits and customs, dangerous and offensive trades and occupations, disinfection and cleansing, are considered in a way that show the hall mark of the practical worker.

School hygiene, a subject of even greater anxiety in the Tropics than at home, to both doctors and teachers in schools of all grades, is sympathetically discussed.

The housing problem shows that the editor and his collaborators are masters of their craft, and have an open mind as regards comfort.

Vital statistics and meteorology, which have a

bearing in India on famine and its consequences, often only too tardily appreciated by lay administrators, are by no means the least important portions of the work that claim the attention and interest of the reader.

A pleasing feature is the introduction of a number of interesting photographs of native scenes.

The type and correct printing are quite up to European standard, and far beyond the average of tropical printing.

BRITISH RED CROSS SOCIETY HYGIENE AND SANITATION MANUAL. By Lieutenant-Colonel S. Guise Moores, R.A.M.C. Five coloured plates and 73 illustrations, pp. 183. London: Cassell and Co., Ltd., 1914. Price 1s.

Although this work is mainly intended for residents in England, it can be confidently recommended for tropical residents, who, for their own sake and those dependent upon their supervision, must have a knowledge of the subject. Many useful hints are given upon house and camp sanitation. The well-designed illustrations, which facilitate the understanding of somewhat technical matters, the format of the book, its well-rounded edges, light weight and an excellent index, all contribute to its ready use in all parts of the world.

MEDICAL ANNUAL, 1914. A Year Book of Treatment, and Practitioner's Index. A Dictionary of Modern Therapeutics, a Dictionary of New Treatment. 32nd Year, 1,000 pp., illustrated in colour and black and white. Published by John Wright and Sons, Ltd., Bristol. Price 8s. 6d. net.

This well-known work thoroughly maintains its reputation, and can be confidently recommended to all who are not in close contact with a good medical library. During the preceding twelve months so much original work has been produced that it is difficult to select special items of interest, but it is satisfactory to note that not only is the information of the whole medical literature of the world epitomized, but also that the writers are resident in the chief centres of Europe, Asia, and America—as Frankfort, Vienna; from Leeds there is an article furnished by Sir Berkeley G. A. Moynihan; from Fall River, Mass., Dr. Richards writes upon Diseases of the Ear; Dr. Gruner (Montreal) upon Clinical Pathology; Dr. Tucker (Virginia) upon Pellagra; and by no means of least interest is the article by Major Leonard Rogers, of Calcutta, upon Tropical Diseases.

THE BACTERIOLOGICAL EXAMINATION OF FOOD AND WATER. By William G. Savage, M.D. Demy 8vo., pp. x + 174, with 16 illustrations. London: Cambridge University Press. Price 7s. 6d. net.

This work, which will be of considerable assistance to all bacteriologists, makes a special claim upon members of public health sanitary committees. That large body of educated, intelligent people interested in problems of public health, with a moderately careful study of this volume, will be able to appreciate the difficulties of bacteriological examinations and the deductions to be drawn from the data obtained.

The methods described are of practical value and proved utility, and the reasons given why the conclusions are arrived at may be used as a basis of administrative action.

Chapters are devoted to water, air, soil and sewage, milk and meat. The appendix contains the method of preparation and standardization of the most approved culture media.

ATLAS TROPISCHER DARMKRANKHEITEN. By Dr. Gustav Baermann and Dr. Otto Eckersdorff. Published by Johann Barth, Leipzig, 1913. Price 80 marks.

This is an exhaustive work on the subject, dealing with all tropical diseases of the intestine. There are fifty-seven coloured plates, including photomicrographs. Particularly noteworthy is the consideration of dysentery, both amæboid and bacillary. It embodies the results of a long and careful study in the Dutch West Indies. We are in the habit of seeing beautiful illustrations of macroscopic and microscopic pictures produced by this well-known Leipzig firm, but the illustrations in this work are equalled by few and surpassed by none.

Although the work primarily deals with tropical diseases, it will be of interest to all workers on the functions of the intestines. The picture of mercurial enteritis is of special importance to those interested in medical jurisprudence.

In spite of the work being somewhat large for a private library, there is all the more reason why it should find a resting place in every up-to-date medical library.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"British Medical Journal," February 21, 1914.

Appendicitis in Children.—H. M. W. Gray, F.R.C.S., and Alex. Mitchell, M.Ch., contribute an analysis of 200 cases of appendicitis in children under thirteen years of age operated on in the Aberdeen Royal Hospital for Sick Children.

The special points to which they direct attention are: (1) The fulminant nature of appendicitis in children. We have had several cases of diffuse peritonitis with stinking effusion where the children had been playing in the street within twelve hours before admission to hospital. (2) Diffuse peritonitis, contrary to the usually expressed opinion, is common in children. (3) Abdominal pain and sickness requires careful inquiry and examination of the region of the appendix. (4) Diarrhœa is an untoward sign. (5) Frequent micturition combined with pains coming on suddenly suggests the possibility of appendicitis. (6) Early recognition and early operation are necessary conditions of success in treatment.

Original Communications.

VACCINE LICHEN IN NATIVES.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories,
and
Captain W. Byam, R.A.M.C.
Senior Medical Officer, Khartoum District, Egyptian Army.

Introductory.—Much has been written on the appearance of vaccination rashes of all descriptions in the white skin, but, as far as the literature at our disposal here indicates, very few observations have been made on the same conditions as seen in the black skin of African natives.

Skin eruptions as depicted in illustrations of diseases occurring in white people seldom appear applicable to the black skin because some of the signs, for example, those indicating inflammation, and especially the redness seen in the white, are with difficulty observed in the black skin.

We therefore are of the opinion that any contribution which attempts to depict an eruption as seen in dark-coloured peoples may possibly be of help to other workers who, like ourselves, may have encountered considerable difficulties in making diagnoses of skin rashes.

Historical.—There appears to be a dearth of descriptions of vaccinial rashes as seen in the African native, but there are references to septic and syphilitic rashes following vaccination, and there is an excellent paper by Hill and Ross on "Epidemic Generalized Vaccinia," as seen in Natal. These authors say that "the occurrence of a general cutaneous eruption consequent upon vaccination is a possibility generally recognized, but the meagre literature on the subject and the scanty and brief references in the present-day text-books of medicine indicate that the condition is only occasionally encountered."

They, however, proceed to give an account of a rash quite unlike that which we have met with. In fact, only Crocker has described an eruption which appears to be in any way similar to that which we have seen. He says that he has notes of over twenty cases of the so-called "vaccine lichen," which he describes as follows:—

"It may be papular, papulo-vesicular or pustular, very rarely bullous. It comes out from the fourth to the eighteenth day, most frequently on the eighth; begins on the arms in half the cases, and on the trunk, neck or face in the rest, and then by successive crops it may spread over a considerable part or the whole of the body, pretty evenly distributed and sometimes tending to form circles or segments of circles.

"The papules are acuminate, pin-point-sized and bright red, and these characters may be preserved to the end. They usually remain discrete, but sometimes coalesce into patches, but as a rule a good proportion of the papules are crowned with small vesicles and pustules and have a red areola sometimes ½ in. in diameter, the vesicles or pustules being generally small. In a moderate number of cases the eruption, as a whole, is vesicular or, rather, papulo-vesicular, but it is rarely entirely pustular.

"In ordinary cases when the small vesicles dry up they leave the base as a flat shining papule, like lichen planus.

"There is rarely any constitutional disturbance and usually only moderate itching, but occasionally it is severe.

"The rash lasts from a few days to a week or two."

The above description is taken verbatim from Crocker's book on "Skin Diseases," merely omitting his references to the bullous and the vesiculo-pustular forms of the eruption, which do not concern us. None of our cases showed pustules or bullæ, but the rest of his description, as we shall show later, agrees with the eruption which we have seen.

Norman Walker, in plate 7 of the 1904 Edition of his "Introduction to Dermatology," depicts a condition apparently analogous to that which we are about to describe, but in the brief reference to it in the text he considers the condition to be a vaccinial eruption of septic origin, a statement with which we cannot agree. Moreover, he calls it an erythema, but his illustration shows elevated papules which must be identical with those of Crocker's eruption and our own cases. According to Schamberg, vaccine lichen is excessively rare. Very excellent summaries of vaccination rashes are given by Acland in Allbut and Rolleston's "System of Medicine," 1906, and Morris in his "Diseases of the Skin," 1911, the latter's classification being:—

(1) Eruptions due to the vaccine virus.

(2) Eruptions due to the vaccine virus together with an additional virus.

(3) Sequelæ of vaccination.

Acland's classification is much the same:—

(1) Eruptions peculiar to vaccination.

(2) Eruptions not peculiar to vaccination.

(3) Complications.

The eruption which we are about to describe is easily classifiable under these systems, but, strange to say, neither of the above authors includes a description which agrees with what we have seen.

Racial and Geographical Distribution. — The natives among whom we have found the vaccinial eruption about to be described belonged to two races of Nilotic negroes of the Anglo-Egyptian Sudan, viz., Nuers and Nubas.

The Nuers are a powerful race, living in the Upper Nile and Bahr-el-Ghazal Provinces, just north of the well-known Dinka tribes, to whom they are apparently allied. The skin of both Dinkas and Nuers is quite black.

The Nuba tribes live in the hills of Southern Kordofan, a name probably of Nuban origin. The skin of these natives is very dark, being almost black. Both Nuers and Nubas are devoid of clothing in their natural condition.

A few weeks ago a number of Nuers and Nubas were brought as recruits to Khartoum and were duly

vaccinated in two quite separate detachments, twenty-four on February 10, 1914, and thirty-six on February 23, 1914. The vaccinia developed well in all cases, but eleven cases, *i.e.*, eight Nuers and three Nubas, developed a peculiar eruption. Of these the eight Nuers belonged to the first batch and the three Nubas to the second batch. It will thus be observed that the eruption appeared in two quite distinct races of Nilotic negroes in two quite distinct batches, but all vaccinated with the same supply of glycerinated lymph derived from one calf obtained from the laboratories of the Egyptian Public Health Department in Cairo.

Sex and Age.—All the patients were young, strong males about 18 to 20 years of age.

Symptomatology.—In every case the vaccination took well and developed normally, and in no case was there any sign of septicity or infection.

A brief summary of the symptoms presented by these eleven patients is as follows:—

Some seven to nine days after vaccination the patient complained of a sensation of itching in various parts of the body, but most commonly at first on the forearms. This was followed in a few hours by an eruption of dark-coloured maculæ, which quickly became papules. They appeared first upon the backs of the hands and forearms, then on the back of the neck, then on the face, chiefly on the forehead, the chest and back, coming out in successive crops. The number of these papules varied considerably in different cases from a few dozen to several hundred.

When fully developed the skin eruption consisted of well-defined small papules (fig. 1) or papulo-vesicles, because even those which showed no vesicles to the naked eye produced a hard, shotty sensation on palpation, and on microscopical examination (figs. 2, 3 and 4) were each found to contain several minute vesicles.

These papules or papulo-vesicles were raised some 3 mm. above the surrounding skin, which as a rule appeared normal, though in some of the cases it was distinctly congested, and in one case there was such marked swelling of the whole arm as to partially obscure the papules until it subsided.

Some of the papules showed small vesicles at the periphery or on the summit, but these easily seen vesicles were relatively few and no pustules or bullæ were ever observed.

In size a fully-developed papule was comparable to a large pin's head, and in appearance it was rather flatly acuminate or, perhaps more correctly, sharply dome-shaped.

In every case the onset of the eruption was heralded by a mild attack of fever, the temperature rising as high as 102° F. in some of the cases, but this febrile attack subsided as the rash developed and the temperature did not again rise above normal. During the febrile attack some of the patients suffered from a dry cough, which became worse as the eruption developed and then slowly disappeared. There was no vomiting, diarrhœa, or other symptom worthy of record, while the progress of the local vaccinia was quite normal. The blood showed no malarial or other parasites, but there was a leucocytosis and a marked relative increase in the mononuclear leucocytes and in the eosinophile cells.

After lasting some four to five days the rash slowly disappeared, but this was associated with a well-marked desquamation where the papules had been present (fig. 5).

When the rash disappeared and, indeed, for some time previously, the patients were not merely in good health, but indignantly well, wishing to return to their work.

Morbid Anatomy.—In order to study this condition more carefully a biopsy was performed and two papules were carefully removed from the forearm and at once fixed with Schaudinn's fluid and eventually cut into serial sections and stained by means of hæmatoxylin and eosin by Gram's and by Leishman's methods.

On microscopical examination by the aid of a low power magnification (about 100 diameters) the most obvious pathological features are an increase in the depth of the stratum corneum and the presence of small vesicles lying, as a rule, between the stratum corneum and stratum lucidum on the one hand, and the stratum granulosum on the other. It was also remarked that the whole stratum corneum and a part of the stratum lucidum showed a tendency to separate from the rest of the epidermis.

The small vesicles or cavities varied in size from a vacuole visible only with higher magnifications to a vesicle easily visible with a magnification of much less than 100 diameters. The larger vesicles were always situate laterally in the section (laterally in the papule).

In places, with the sole exception of the thickened stratum corneum, the section appears to be quite normal. The stratum lucidum in these places is normal, and so are the strata granulosa, malpighii and germinativæ. The papillæ and dermis also appear to be quite normal and there is no leucocytic invasion of the rather thick prickle cell layer. The principal pathological changes appear to be associated with the stratum granulosum and the parts external to this. In a superficially lying cell of the stratum malpighii one may see a minute clear, round eosinophile body lying in the cytoplasm. In another cell more properly belonging to the stratum granulosum it may be observed that the degenerating nucleus is lying in a vacuole, while a larger clear, round eosinophile body lies in the cytoplasm. This body appears to contain several dark staining spots. In the stratum lucidum the cell (the nucleus having disappeared) may be reduced to a vacuole in which one or more of the clear round bodies may be seen, but at one part of the stratum lucidum several cells have evidently combined to form a minute vesicle, containing a number of eosinophile round bodies and a large number of granules.

Only two biopses were made and therefore papules with vesicles apparent to the naked eye were not examined microscopically.

Etiology.—The general appearance of the eruption before any of the minute vesicles appeared was

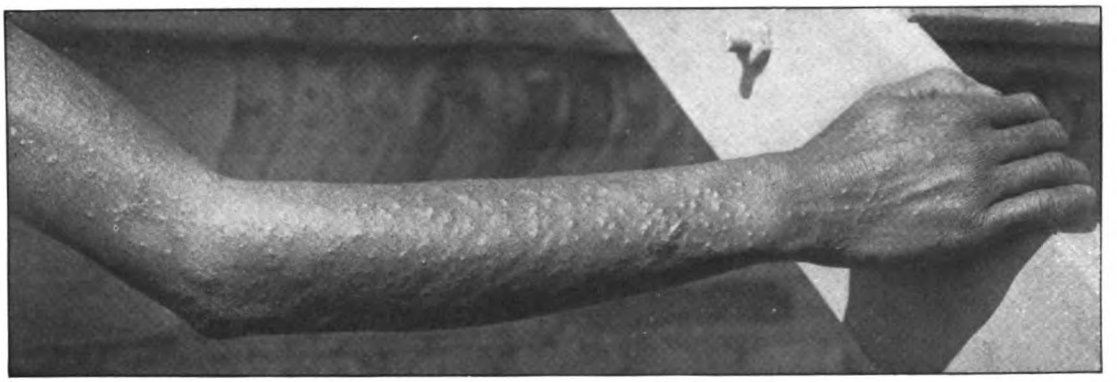


FIG. 1.

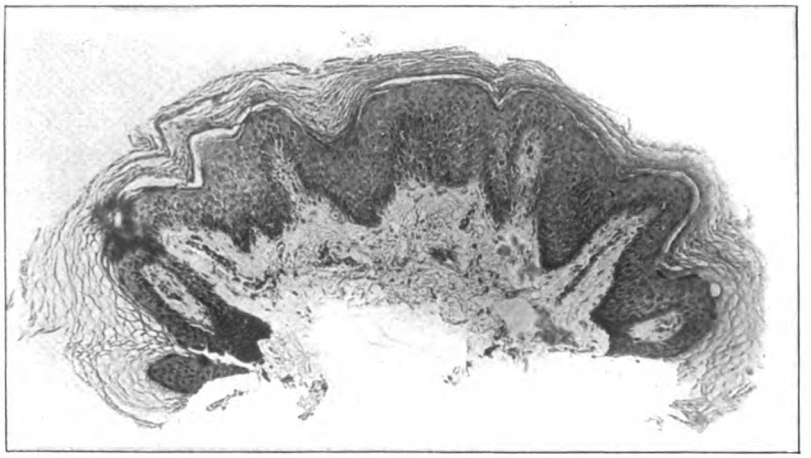


FIG. 2.

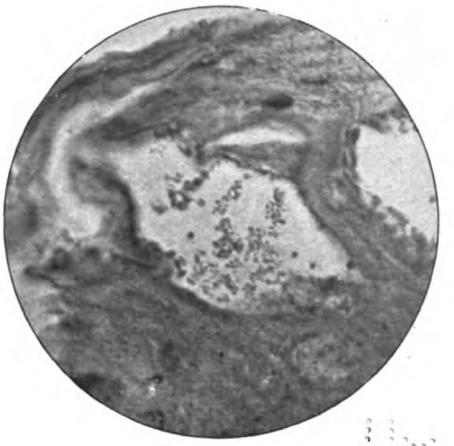


FIG 3.



FIG. 4.

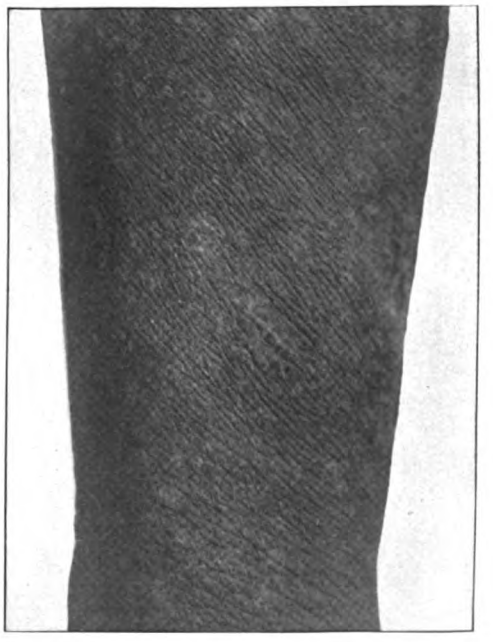


FIG. 5.

To illustrate article, "Vaccine Lichen in Natives," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and Captain W. BYAM, R.A.M.C.



that of a lichen, but it did not agree with any of the ordinarily described types of the disease.

Scrapings of the papules examined after treatment with 40 per cent. caustic potash failed to reveal any fungal hyphæ or spores, and subsequent staining by Adamson's and by the Oxford method also failed to show any trace of fungi.

Inoculations of various nutrient media with portions of a papule, after skin sterilization by means of absolute alcohol, failed to grow bacteria or fungi even after four weeks, except one or two obvious skin contaminations.

Animal inoculations were not performed, as the true nature of the eruption was not at first recognized.

Suspicion was later aroused that the eruption might in some way be connected with the vaccination, which was taking its normal course; the suspicion was strengthened when an identical eruption appeared in a second batch of vaccinated Nubas.

Inquiries made from the Egyptian Public Health Department, where this vaccine was prepared, elicited the fact that it had produced no such eruption in Egypt. No septic nor infectious diseases were found to follow the use of this vaccine in Egypt nor in the Sudan, with the sole exception of this rash in two sets of Nuers and Nubas vaccinated at quite different times.

But the fact remained that the rash did appear in these Nuers and Nubas, who are people quite unaccustomed to vaccination, though small-pox and a so-called chicken-pox, some of which may be alastrim, because it is said to closely resemble small-pox, may occur in African tribes. People just recovered from typical alastrim are, of course, susceptible to Jennerian vaccination.

Moreover, the time of the appearance of the rash after vaccination was suggestive that it was a vaccinial eruption. The type of the eruption also was very like that described by Crocker in the twenty cases already mentioned. It was therefore concluded that the eruption was vaccinial in nature, *i.e.*, was a generalized vaccinia.

The morbid anatomy, the finding of small vesicles, their method of evolution and the peculiar granules which they contained all supported this view.

The granules in question, however, require further discussion. They are obviously not artefacts, and they resemble closely the bodies called chlamydozoa by von Prowazek in 1907, *i.e.*, there are minute granules, free or enclosed, in an eosinophile cloak. They increase in number as the vesicle increases in size, but whether this is a true multiplication or an addition to the number already existing by the rupture of a neighbouring cell cannot be stated. When compared with photomicrographs, illustrations and descriptions of Guarnieri bodies, some of them are found to closely resemble the forms depicted and described. Further, Guarnieri bodies are associated with vaccinia and variola. Taking all these points into consideration, we believe that some of these are Guarnieri bodies, which are thought by many authorities to be parasitic, and by others to be cellular degenerations, but both agree that they are to be found in the lesions of vaccinia.

We therefore are of the opinion that these bodies support the clinical diagnosis that the rash was vaccinial, but we have not applied the crucial test of attempting to vaccinate another person or animal from one of these lesions, as the true nature of the eruption was not apparent to us at first.

Further, the observation that the lymph did not produce untoward symptoms in a number of vaccinations nor in an inoculated monkey points to the certainty that pure lymph was used.

Very elaborate experiments on variola and vaccinia in quadrumana, together with an extensive review of the literature, have been made by Brinckerhoff, Tyzzer and Councilman in Manila. These observations are so complete and are so much in agreement with other investigators' work that it did not appear to be in accordance with the present clinical paper to repeat their experiments.

To summarize, we are of the opinion that the ætiological factor in producing the rash was pure, uncontaminated calf lymph which for some reason became disseminated in small quantity throughout the body and produced a generalized eruption of a much milder type than that usually described under the heading generalized vaccinia, but one which can be included under Heading I. of either of the classifications given above.

Diagnosis.—A papular eruption in the years that are gone would have been defined as *a lichen* in the sense of the word used by Willan, but not in its more restricted sense as used by Hebra, because many of the papules became vesicles. The present eruption is, therefore, easily differentiated from any of the lichens used in the restricted sense of the word for eruptions which remain as papules during their whole course.

This particular form of lichen, in the broad sense of the word, is a papular and papulo-vesicular eruption, commencing with fever some eight days after vaccination.

From the description given by Crocker of his twenty cases and the record of our own cases we would suggest the following diagnostic points:—

A papular or papulo-vesicular eruption beginning about eight days after vaccination and heralded by slight or no constitutional disturbance, but with moderate itching, and usually commencing on the arms, is most probably this eruption which may be called a *vaccine lichen*, but which would be better termed a *papulo-vesicular vaccinia*.

The diagnosis should be confirmed by attempts at vaccination of a monkey from a papule or a vesicle.

The differential diagnosis may be made from:—

Lichen acuminatus by the fact that the hair follicles are not attacked.

From *craw-craw* (in the restricted sense of the word) by the absence of the horny consistency, and by the smaller size of the vaccinial papules.

From *lichen convex* by being non-follicular and by being an acute and not a chronic eruption.

From an ordinary *generalized vaccinia* by the

main lesion being a papule and by the usually small size of the vesicles.

Prognosis.—This is invariably good, as all our cases and apparently most of Crocker's cases recovered very quickly without any scarring or pigmentation. Crocker has pointed out that it may go on to vesiculo-pustular formation, and in some of these cases fresh crops may continue to appear for months, or the vesicles may enlarge and become herpetiform or bullous; but it is possible that these exceptional forms are due to secondary infections and not solely to the lymph.

Treatment.—The essential treatment is rest and quiet. We gave all our patients quinine by the mouth and an antiseptic ointment, *i.e.*, carbolic ointment, for the skin, and on this treatment they rapidly recovered.

Prophylaxis.—We can offer no explanation why eleven out of sixty persons vaccinated by the same lymph and belonging to the same African tribes, living under similar conditions, and about the same age and of the same sex, should develop an eruption while others did not. We are therefore unable to suggest any prophylactic measures.

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ILLUSTRATIONS.

The illustrations are improved if examined by means of a lens.

FIG. 1.

Photograph of the right arm of a Nuer, showing the fully developed vaccine lichen. A scar of previous origin also shows in the photograph.

FIG. 2.

Photomicrograph of a transverse section of a small papule taken from the case depicted in fig. 1. Note the small vesicle beginning on the right. × 120.

FIG. 3.

Photomicrograph of small vesicles in the same papule as that used for fig. 2, but in a different section. × 1,370.

FIG. 4.

Photomicrograph of the larger vesicle from a larger papule taken from the same case as that depicted in fig. 1. × 1,400.

FIG. 5.

Photograph of the left arm of the same case as that of fig. 1, howing the desquamation.

A LIST OF BLOOD-SUCKING ARTHROPODS FROM THE LOWER CONGO, WITH A VOCABULARY.

By MERCIER GAMBLE, M.D.

The B.M.S. Hospital, San Salvador do Congo.

My time is mainly taken up with the ordinary routine of a Medical Mission with a dispensary attendance of 30,000 per annum, but in addition, because of their medical interest, I have collected the following arthropods. The majority have passed through the Imperial Bureau of Entomology, and I have pleasure in recording my thanks to Mr. Guy Marshall for much courteous help.

I have been located at San Salvador,* in the Portuguese section of the Lower Congo Basin. It is about ninety miles south-east of Matadi, the port of the Belgian Congo, and is on the crest of a hill with an altitude of 1,840 ft. in an undulating grass-covered country. Even close to the town the grass grows to the height of 15 ft., and the stems are used for building the walls of the huts.

Stomoxys is our most common fly, *nigra* more than *calcitrans*, and is a great pest in the hot wet season from March to May. It causes large sores on the ears of our dogs and annoys the poultry, especially those with double combs. It drove me on my arrival to take my siesta under a mosquito net, a habit I wish my colleagues would adopt. It is also no doubt one of the many flies that feed on the discharges from septic wounds and unprotected ulcers, and I wonder if, in addition to being the most likely carrier of pellagra in the United States, it is the carrier of *Filaria perstans*, which we see so frequently when examining the blood of patients.

We see few *Tabanids*, except *congoiensis* and *claripes*, and these do not average one a week.

Tsetse are so few that they are probably followers only.

Stegomyia fasciata is common in the wet seasons, and on more than one occasion the Government has sent round the town-crier ordering the destruction or burial of old tins and calabashes.

The *Eretmopodites chrysogaster* were bred from the larvæ found in an old tin.

We seldom see *Anopheles;* in fact, I had to send my boys down the hill to the streams in order to obtain the larvæ.

Culicoides grahamii is common at sunset in April and May; the bite is more painful but less persistent than that of Stegomyia.

Ornithodorus is common in the sandy towns of Kibokolo,* Ndamba and Mabaya.* Our local natives dread the bite and the subsequent fever, and so I have supplied some of them intending to travel to infected districts with a preventive lotion of naphthalene, creosote, castor and paraffin oil. They have reported favourably on the effects. Some *Ornithodorus* placed in a small cardboard box

* "Geographical Notes." JOURNAL OF TROPICAL MEDICINE AND HYGIENE, February 15, 1912.

lived there for twenty-one months without any food or moisture, thus showing the possible danger of occupying even a very old camp site.

Our house-dogs are much infected with ticks, even though twice weekly we have them washed in disinfectants and have the ticks removed with the aid of a pair of forceps.

I have not seen a fowl-tick, though from 500 to 1,000 fowls are brought to the station yearly. The ticks collected have been determined by Professor G. H. F. Nuttall and Mr. C. Warburton, and I desire to thank them; as also Rev. R. H. C. Graham for his help with the vocabulary.

Kimpese is on the railway about half-way between Matadi and Thysville, and Wathen* or Letete is to the north of it, a few miles south of the River Congo. I had been requested to visit our stations at these places and report on the health conditions.

CULICIDÆ.

Anopheles costalis, Lw.	San Salvador, 1908.
,, *funestus*, Giles ...	San Salvador, 1908. Kimpese, viii.1913.
,, *pitchfordii*, Giles ...	San Salvador, iii.1913.
,, *rufipes*, Gough ...	Wathen, viii.1912.
Banksinella luteolateralis, Theo.	San Salvador, 5.ii.1912.
Culex annulioris, Theo. ...	,, xii.1911.
,, *decens*, Theo.	,, vi.1912.
,, *duttoni*, Theo.	,, xii.1911. Wathen, viii.1912.
, *invidiosus*, Theo.	San Salvador, xii.1911.
,, *rima*, Theo.	,, xii.1911.
,, *tigripes*, Gyp.	,, 28.xi.1912.
,, *tigripes*, Gyp., var. *fuscus*, Theo.	Wathen, viii.1912.
,, *univittatus*, Theo. var. ...	San Salvador, vi. 1912.
Eretmopodites chrysogaster, Graham	,, xii.1911.
Mansonioides uniformis, Theo....	,, 29.xi.1912.
Ochlerotatus argenteopunctatus, Theo.	,, xii.1911.
Ochlerotatus domesticus, Theo....	,, ix.1912.
,, *quasiunivittatus*, Theo.	,, xii.1911.
Stegomyia africana, Theo. ...	Kibokolo do Zombo, iv-v. 1911.
,, [1] *fasciata*, F. ...	San Salvador, iv.1912.
,, *simpsoni*, Theo. ...	,, iv.1912.
Tæniorhynchus [2] *cristatus*, Theo.	,, 1908.

TABANIDÆ.

Chrysops longicornis, Macq. ...	San Salvador, 1909.
Tabanus billingtoni, Newst. ...	Kibokolo, iv-v.1911.
,, [3] *canus*, Karsh. ...	San Salvador District, 1909.
,, *claripes*, Ric.	San Salvador 1 ♀, ix.1910. 1 ♂, 8 ♀, 1912.
,, [3] *congoiensis*, Ric. ...	San Salvador, 1908. Kibokolo, iv-v.1911.
,, *corax*, Lw.	San Salvador, ♂ ♂ and ♀ ♀.
,, *gratus*, Lw.	Kibokolo, 1 ♀, iv-v.1911.
,, *ianthinus*, Surc. ...	,, ♀ ♀, iv-v.1911.
,, *laverani*, Surc. ...	Leopoldville, Belgian Congo, ix, 1910.
,, *ruficrus*, P. de B. ...	Leopoldville, ix.1910. San Salvador, xi.1912.
,, *thoracinus*, P. de B. ...	,, 1908.
,, sp. nov. ? near nyassæ, Ric. ...	Fulezi River, San Salvador, 1 ♀, xi, 1912.
,, [3] *pluto*, Walker ...	San Salvador, 1909.

TABANIDÆ (*contd.*)—

Hæmatopota cordigera, Bigot ...	San Salvador, 1 ♀, xi.1912.
,, *denshami*, Austen ...	Kibokolo, 1 ♀, 2.iv.1911.
,, *pellucida*, Surc. ...	,, 1 ♀, 2.iv.1911.
,, sp. nov. ?	(*a*) 1909, near *brunnescens*, Ric. (*b*) 3 ♀, San Salvador, i.1912 near *brunnescens*, Ric. (*c*) 1 ♀, San Salvador, 25.x. 1912.

MUSCIDÆ.

Glossina palpalis, R. D. ...	Universal, San Salvador, Mabaya, Kibokolo, Ambriz River.
Stomoxys calcitrans, L.	San Salvador and Kibokolo.
,, *nigra*, Macq.	San Salvador, Kibokolo, Mabaya.

CHIRONOMIDÆ.

Culicoides [4] *grahamii*, Austen	San Salvador, 1909.

TACHINIDÆ.

Auchmeromyia luteola, F. ...	San Salvador, Kibokolo, Mabaya.
Cordylobia rodhaini, Gedoelst ...	San Salvador, iii.1911.

SIMULIDÆ.

Simulium griseicollis, Becker ...	Mabaya, v.1912.
,, *damnosum*, Theo. ...	Ambriz River, i.1911.
,, *pusillum*, Fries. var.	Ambriz River.

SIPHONAPTERA.

Sarcopsyllidæ—	
Echidnophaga gallinacea, West ...	poultry and dog.
Pulicidæ—	
Ctenocephalus canis, Curtis	man, dog, cat.

ACARINA.

Argasidæ—	
Ornithodorus moubata, Murray	huts.
Ixodidæ—	
Amblyomma splendidum, Giebel ...	buffalo, pig.
,, *tholloni*, Neum	elephant.
,, *trimaculatum*, Neum ...	monitor lizard.
Hæmaphysalis leachi, Aud	dog.
Rhipicephalus capensis, Koch	buffalo, pig, dog.
,, *falcatus*, Neum	dog.
,, *lunulatus*, Neum ...	dog and pig.
,, *sanguineus*, Latr. ...	dog.

VOCABULARY.

English and Ki-Kongo.	
Bug	Kinsekwa; plural, yinsekwa.
Flea	Nianzi, plural.
,, jigger	Dede.
,, ,, swollen ...	Mumvidi; plural, mimvidi.
Fly, generic	Mbwanzi plural, San Salvador district. Nianzi ,, Kibokolo district.
,, Congo floor ...	Evekwa dia nzo, S. Salvador. Ekungu nianzi, Kibokolo. Ekulumbwanzi, Wathen.
,, horse—	
(1) Hæmatopota...	Evekwa dia mfwila nitu.
(2) Tabanus ...	Evukunia; plural, mavukunia. Evekwa dia nzadi, Kibokolo. nzadi = a river.
,, large generic ...	Ekulumbwanzi.
,, sand (Simulium)	Kinkufu; Bimbundia.
,, stable	Mbwanzi, S. Salvador. Mbwanzi za lau, Kibokolo. lau = madness.
Louse	Nianzi, plural.
,, crab	Maniata.
Maggot	Mumvidi; plural, mimvidi. Ntunga generic Wathen.

* "The Congo Floor Maggot." Dutton, Todd and Christy. *British Medical Journal*, September 17, 1904.

VOCABULARY (*contd.*)—

Maggot, Congo floor...	Mumvidi a nzo, sing., of the house. Mimvidi mia nzo, plu., ,, ,, Mumvidi a nsi, sing., of the ground. Mimvidi mia nsi, plu., ,, ,,
Midge (Culicoides)—	
Morning biter =	Menemene.
Evening biter =	Masikasika.
Mite, as of poultry ...	Mbwengene.
Mosquito	Mbu, collective plural; usual form. lubu, sing.; tubu, plural.
Tick, dog	Nkuba.
,, house	Kinkwambanda. (Ey)ata, sing.; Ma(y)ata, plural. Kibokolo.
Tsetse	Evekwa; plural, mavekwa.

For teaching purposes I have adopted and found useful the following compound words:—

Menga = blood.
Kimpadi = a small fast-swimming fish.
Therefore—
Kimpadi kia menga = a trypanosome.
Yimpadi ya menga = trypanosomes.
Kimpiatu = a caterpillar generic.
Therefore—
Kimpiatu kia maza; plural, yimpiatu ya maza, a caterpillar of the water = a larva.
Yimpiatu ya mbu = mosquito larvæ.
Kinkete = a chrysalis.
Therefore—
Kinkete kia lubu = a single mosquito pupa.
Nioka = a snake.
Niok' a moyo = an intestinal worm.
Therefore—
Niok' a menga = a blood worm.

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[2] EDWARDS: *Ibid.*, 1912, vol. iii, p. 26.
[3] AUSTEN: "African Bloodsucking Flies."
[4] *Ibid*: *Bulletin of Entomological Research*, 1912, vol. iii, p. 100.

ATROPINE IN SEA-SICKNESS.

AS a means of allaying irritation of the vagus nerve—the presumed cause of sea-sickness—atropine in doses of 1 mgr. is advocated.

FLIES AND PUBLIC HEALTH.

THE belief as to the part played by flies in the transmission of disease has been practically acted upon by Dr. E. H. Ross, of New York. In one of the most insanitary quarters of the city, where rubbish of all sorts is allowed to accumulate, where the houses and the stables are filthy, where breeding places for flies abound, and where the infant sickness maintains a high rate, Dr. Ross carried on a crusade against flies, trapping them in the courtyards, waste places and stables, and destroying the breeding places. In a few weeks the sickness rate was markedly reduced. The area thus dealt with showed 110 cases of sickness in children under 5 years of age, whereas in an adjacent unprotected area the rate of sickness amounted to 165.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 15, 1914.

MEDICAL EDUCATION IN CHINA.

AT the meeting of the medical department of the Church Missionary Society held in the Queen's Hall, London, on May 8, 1914, at which over 2,000 people were present, the part played by the medical missionary was prominently set forth by the Chairman, Mr. James Cantlie, F.R.C.S. The Chairman stated that there was a prevalent belief amongst all and sundry that the "medical missionary" or the "missionary doctor" belonged to a separate grade of the profession to those who engaged in private practice at home, or who staffed our hospitals. Somehow, most folk believe, they manage to slip through a modified medical career so that they are not so highly qualified, as far as training, degrees, or diplomas

go, as the other members of the profession in the British Isles. He assured the large audience—and he wished to be able to pronounce it from the housetops so that all the world should know—that this belief is untenable and untrue. He assured the lay audience that there was one way, and one way only, of gaining degrees or diplomas in this country, namely a five years' course, and passing examinations at one of the recognized examining boards. In the subsequent practice of their profession medical missionaries had proved themselves capable and proficient in their profession at all points, and had, moreover, as observers, as original workers and scientific investigators, held their own with any one of our great public services. To the recognized public services of the country—the Naval, Military and Colonial services—the Chairman said he should like to add another, namely, the Medical Missionary service, which was recruited from the same ground as the others, was organized to a higher degree, and possessed men as proficient in their work both scientifically and clinically as those met with in the services or in public and private positions in civil life.

The chairman next dealt, by request, with the question of medical work in China. This he did by referring to the present facilities for medical education. In this he was guided by the statements made by Dr. Wu Lien-Teh, M.A., M.D. (Cantab.), Medical Officer to the Foreign Office of the Chinese Government. The "Memorandum on Medical Education in China" (published in the *China Medical Journal*, March, 1914), drawn up by Dr. Wu, presents an admirable account of the past and present state of medical education in China and the hopes for the future. The summary presented by Dr. Wu, of the centres of medical teaching in China runs as follows :—

(*A*) *Government Colleges.*—The medical colleges which have been established by the Government are:—

The Peiyang Medical College, Tientsin.

The Army Medical College, Tientsin.

The Army Medical College, Canton. (Now abolished.)

(1) *The Peiyang Medical College* was founded twenty years ago by the late Viceroy, Li Hung Chang. In its early years the management of the institution was in the hands of a British staff, but this work was handicapped from the beginning by inadequate equipment and by an insufficient number of teachers. Instruction was given in the English language, the students coming mostly from Hong-Kong and Canton. Since 1901 the management has been in the hands of French professors who continue teaching in English. The number of students graduating from this college since its foundation in 1893 has totalled 106.

(2) *The Army Medical College*, Tientsin, was founded nearly ten years ago by Viceroy (now President) Yuan Shih Kai to train medical officers for the newly organized modern army of Chihli Province. Since 1909 the Board of War, Peking, has taken over the control of the college. The work was at first entrusted to a Japanese staff, the language used being Japanese. Since 1911 all the teachers have been Chinese, mostly graduates of the College, and Chinese has been the language used. From this College about fifty students have graduated annually and have been drafted mostly into the Army.

(3) *The Canton Army Medical College* was established some years ago to prepare medical officers for the southern army, and the work was entrusted to a staff of Chinese and Japanese teachers. Owing to insufficient staff and equipment, however, the work was never satisfactory, and the College was abolished recently.

(*B*) *Missionary Colleges.*—Many of the larger centres have founded medical colleges for the purpose of training competent assistants to help them in their work. Diplomas are, as a rule, given after four to five years' training, and a considerable number of these men may now be found practising western medicine in different parts of China. The language used to teach the students has in most cases been Chinese.

The tendency in late years has been to centralize their medical teaching in eight large cities, where sufficient staff, equipment, and clinical material are available.

It was decided at the triennial Missionary Medical Conference held in January, 1913, that these cities should be Mukden, Peking, Tsinanfu, Chengtu, Hankow, Nanking (or Hangchow), Foochow, and Canton.

The following resolutions were also passed:—

(1) That the sole object of establishing medical colleges in China is to bring blessings to Chinese people and to give a thorough training in medicine and surgery to young men and women so that they may be of better service to their country.

(2) That they have no desire to make these institutions permanently foreign, but to hand them over ultimately to the Chinese themselves.

(3) That they desire to bring their teaching work into line with the regulations of the Minister of Education and to always co-operate with the Government of the Republic in medical education.

(*C*) *Other Colleges.*—Besides the above-mentioned colleges there exist the following institutions controlled by foreign Governments or corporate bodies where Chinese students can obtain their medical training:—

(1) The German Medical School, Shanghai (started in 1908).

(2) The German Medical School, Tsingtau (opened in June, 1911).

(3) The Harvard Medical School, Shanghai (opened in 1912).

(4) The Japanese Medical School, Mukden (established in 1912).

(5) The Hong-Kong University (opened in March, 1911). The medical faculty of the University consisted originally of the College of Medicine, Hong-Kong, established in the year 1887—the pioneer medical college in China.

Of these five institutions, the German Medical Schools at Shanghai and Tsingtau are supported by the German Government; the Japanese Medical

School at Mukden is controlled and supported by the South Manchurian Railway Company; while the Harvard Medical School is an offshoot of Harvard University in America. The Hong-Kong University, of which the Medical Faculty is the oldest and the most important, is a public institution encouraged and partly supported by the British Government. These centres are essentially for the purpose of giving a sound medical training to Chinese youths, the language employed at the German Schools being German, that at Mukden Japanese, while at the Harvard Medical School and at Hong-Kong University the medium is English. As they are independent institutions it is not known what part they may take in co-operation, but the colleges established by the missions are willing to co-operate with the Chinese Government, and their attitude towards this question should receive careful consideration.

Dr. Wu suggests that a Central Medical Board be established in China to control, to centralize and direct the teaching of medicine in China.

During the meeting at the Queen's Hall, Dr. C. F. Harford read the annual report of the Medical Department of the Society, which was illustrated by a series of excellent lantern slides dealing with many of the countries in which the Society's work is being carried on. These included such widely spread centres as the Afghan frontier, Srinagar, Peshawar, Quetta, Amritsar and several other places in India. In China mention was made of the Union Medical College at Foochow, of Hinghwafu, Ningpo, Taichowfu, Kweilin, Pakoi, Yunnanfu, &c. In Arabia, Palestine, Persia, Egypt, East Africa, Uganda, and West Africa, the Society have hospitals in which assistant and native nurses are being trained.

The meeting was deeply interested in the addresses given by Dr. E. N. Cook, M.B., B.S.Lond., from Uganda; by Dr. H. Gordon Thompson, M.D.Liv., F.R.C.S., from Pakhoi, China; and by H. White, Esq., M.R.C.S., L.R.C.P., from Persia, on the medical work accomplished in the several countries the speakers represented.

J. C.

COURSE IN VENEREAL DISEASE.

AT the London School of Clinical Medicine at the Seamen's Hospital, Greenwich, a course of instruction in venereal disease has been arranged. The first course will commence on Monday, May 25, 1914. We beg to congratulate the hospital authorities upon their public spirit in coming forward to supply a course of instruction which is much in demand at present. At no other hospital are better opportunities obtainable for the study of this branch of medicine, for in the hospital some thirty-five beds are specially assigned to cases of venereal disease. To officers in the Public Medical Services, to doctors on board ships, and to practitioners proceeding to the Tropics, the course will prove especially useful. From the evidence before us, it is plain that the classes will be well attended. The clinical material is plentiful, and the teachers who are to give the lectures and laboratory instruction are all well equipped.

Annotations.

New Malarial Parasite of Man.—In the *Proceedings of the Royal Society* of April 8, 1914, is published a paper by J. W. W. Stephens, on "A New Malarial Parasite of Man." This parasite was seen by the author in a single blood slide which had been made from a child in Pachmari, Central Province, India. Its characters are somewhat like those of the parasite of sub-tertian malaria, but it differs in being extremely amœboid, as indicated by great irregularity in shape, the cytoplasm is very scanty, and the chromatin out of proportion to the volume of the cytoplasm. Pigment granules were not detected. The parasite is illustrated in a coloured plate. The author proposes to call this parasite *Plasmodium tenue*, believing it to be distinct from the ordinary parasite of sub-tertian malaria.

Epidemiology of Dengue.—Dr. H. Seidelin under the heading "Epidemiological questions" (*Yellow Fever Bureau Bulletin*, April, 1914) remarks that our knowledge with regard to the epidemiology of dengue and pappataci fever is very limited, and it is only during the last few years that serious attention has been drawn to them. He further states that although we have a working hypothesis on which to base our knowledge of the epidemiology of Yellow Fever it will not be possible until the parasite has been observed, and its prevalence investigated in both man and the mosquito, to give a detailed account of the epidemiology of the disease.

Dr. Seidelin condemns the use of the term "mosquito fever" for the various short fevers met with in tropical climates.

A letter from Dr. Juan Guiteras, of Cuba, published under the heading of "Endemicity of Yellow Fever," discusses Dr. H. Seidelin's report on "Vomiting Sickness," published in the November number of the *Bulletin*. The discussion rages around a sporadic case of illness in a Chinaman in Jamaica, which Dr. Seidelin diagnosed as yellow fever. Dr. Guiteras doubts the diagnosis on the ground that Chinese are believed to be practically immune; that no fever was present; that the jaundice was slight and doubtful; the pulse-rate was high, 90 instead of about 70; and that the greenish fluid with coffee-ground-like mucous streaks found in the stomach after death is an unusual condition. Dr. Seidelin replies to the criticisms and upholds the diagnosis he had previously made, and points out the diagnosis of mild cases of yellow fever is a matter of some difficulty at times. The bearing of this discussion is important as regards the endemic prevalence of yellow fever. Dr. Seidelin maintains that yellow fever apparently disappears for years, and, without any evidence of re-introduction, reappears in virulent form. He holds that during the end an endemic infection continues in an attenuated form, causing mild and atypical cases of the disease; and that these cases are the most dangerous from an epidemiological point of view.

It is interesting in this connection to note that from Puerto, Mexico, a number of cases resembling yellow fever, occurring simultaneously with a few typical cases, have recently been reported. There seems little doubt that yellow fever may declare itself in mild or atypical form, or as a more severe type, resembling yellow fever, or in a virulent form; that the virulent form occurs at intervals, but that the infection is kept alive during the intervals and causes mild attacks, and that yellow fever may therefore occur apparently spontaneously in a community, that is, that it breaks out in an endemic area without reintroduction from without.

Dr. J. W. Scott and Dr. J. E. L. Johnston contribute a paper to the *Bulletin*, describing their experiments and observations in yellow fever. They declare that at Lagos, Southern Nigeria, where an epidemic of yellow fever prevailed in 1913 (and continued at the time of writing), they met with typical cases of yellow fever, but that many natives presented a mild type of the disease only.

Drs. Scott and Johnston found the *Paraplasma flavigenum*, described by Seidelin, in all the cases of yellow fever they examined; and the experiments they made upon guinea-pigs, dogs, and rats, showed that inoculations of these animals by blood from yellow fever cases showed that this parasite was present in the red blood corpuscles of the inoculated animals.

Summary of Conclusions: In 1909, Seidelin described bodies in the blood of yellow fever patients which he believed to be the parasite of the disease.

On commencing our investigations at Lagos we were first at a disadvantage, as we had not seen specimens of these bodies. It was not long, however, before we discovered in the red corpuscles bodies which we believed to be identical with the *P. flavigenum*. [These have since been declared to be *P. flavigenum* by Seidelin.] We have found these elements in practically every case of yellow fever we have examined, and also in guinea-pigs, dogs, and rats that had been inoculated from human cases. We have found guinea-pigs the most susceptible of the animals with which we have experimented, and we have succeeded in conveying the *Paraplasma*-bodies by sub-inoculation.

These *Paraplasma*-bodies are by no means always scanty. They are as a rule sufficiently numerous to be a valuable aid in diagnosis, as we have already experienced, and further, an assistance in the study of yellow fever. Thus we have found them in the blood some days after the subsidence of the fever, when the patient was apparently convalescent, and we have succeeded in infecting guinea-pigs by inoculations made as late as the eighth day.

Now, in natives, yellow fever is often a mild, almost trivial, illness, and patients often insist that they feel well after but one or two days in hospital. In their own homes they would, no doubt, go about freely at this stage of the disease, whilst the *Paraplasma*-bodies are still to be found in the blood. If, as we believe, these bodies are the parasites of yellow fever, these patients should be capable of infecting mosquitos and of further spreading the disease. In other words, the patient would be infectious for longer than the generally ascribed period of three days.

The successful inoculation of dogs and rats suggests a possible subsidiary means by which the disease may be kept endemic, in spite of stringent sanitary regulations.

Dr. W. S. Clark, West African Medical Staff, reports upon "Cases resembling Pappataci Fever," observed at Jballan, Southern Nigeria. The patients were British residents: three had sharp attacks, whilst two had but mild illnesses. The attacks resembled those described as peculiar to Pappataci fever. The mosquitos met with in the bungalows of the patients were *Culex fatigans*, *C. tigripes*, *Stegomyia fasciata* and *Culiciomyia sp.*; no anophelines were observed at that time of the year. Of the six British residents five were attacked, Dr. Clark himself was the only one of the six who escaped the illness.

Abstracts.

EMETINE AND IPECACUANHA; THEIR AMŒBACIDAL VALUE IN PATHOGENIC AMŒBIASIS.*

By R. Markham Carter, I.M.S.

EMETINE administered hypodermically in doses of 1 to 2 gr. per diem acts rapidly in early cases of uncomplicated amœbic dysentery in Europeans and Indians.

Emetine is valueless in bacillary dysenteries. Emetine is a specific in pre-suppurative amœbic hepatitis, and is of marked value in chronic latent amœbic colitis which gives rise to the above condition. The value of emetine in liver abscess is doubtful, and rational operative treatment without the exhibition of emetine gives as good results as it does with the drug.

If amœbic dysentery has lasted for a week or more we find that emetine injections destroy the vast majority of the amœbal trophozoites in the first twenty-four hours, but the stools rarely become amœba-free under seventy-two hours.

Further, such cases of intestinal amœbiasis, even after a week's injections and apparent cure by emetine, have in some cases a tendency to relapse.

The true emetine amœbacidal effect is delayed in patients who are confirmed opium eaters, and experience has shown me that in spite of vigorous emetine treatment, it is from the slaves of opium that we get our cases of rapidly fatal acute gangrenous dysentery. I believe this is due, not to an antagonistic neutralization of the action of emetine by one of the many opium alkaloids, but to the effect of opium on the intestinal contents whereby the amœba-laden fæces stagnate in the pouches of the large intestine.

* From the *Indian Medical Gazette*, March, 1914.

In the treatment of human amœbiasis the doses of emetine for an adult should be at least 1 gr. per diem, and in severe cases the drug should be pushed without hesitation. Minute doses of ½ gr. do harm instead of good, as I believe they so sensitize the residual store of undestroyed amœbæ in the gut-wall as to render them emetine proof. Such cases pass out from the hospital apparently cured, but are amœbal cyst carriers and sources of infection to others.

I am fully convinced that acute amœbic dysentery requires, as well as the exhibition of the alkaloid emetine, the entire root with all its alkaloids in powdered form. My standard daily dosage for an adult is 90 gr. pulv. ipecacuanhæ in 5-gr. pills salol coated and 1 gr. emetine hydrochloride hypodermically. In the former we ensure the intestinal contents are thoroughly permeated with the drug; in the latter we reinforce the amœbacidal effect of the parent drug upon the parasites buried in the wall of the affected intestine by the hypodermic injections of emetine carried to these by the blood-stream.

THE INFECTIOUS DISEASES: RECENT ADDITIONS TO OUR KNOWLEDGE OF THEIR ETIOLOGY.*

By JOHN F. ANDERSON.

POLIOMYELITIS.

IN 1909 the disease was transmitted to monkeys by inoculation with an emulsion of the spinal cord from a child who died on the fourth day of an attack of infantile paralysis.

The disease may be transmitted by inoculation to monkeys and occasionally to rabbits. The disease belongs among the filterable viruses; that is, its virus is capable of passing through earthenware filters and is so minute that it probably cannot be seen except by the use of special methods, even with the highest powers of the microscope. It has been shown that the virus is present in various organs of human beings dead from poliomyelitis and that the tonsils of monkeys five months after the acute stage of the disease still contain the infective agent. The same is probably true of human beings, and such persons might well become sources of infection.

Poliomyelitis may be produced in monkeys by the inoculation of filtered washings from the mouth and nose, from the trachea, and from the small intestine, collected at autopsy from cases of infantile paralysis dying in the early stages of the disease.

The virus of the disease is found in the buccal and intestinal secretions of persons who gave no history of recent illness, but who have come into intimate contact with other persons in their families sick with poliomyelitis. Such virus carriers are most likely very common during epidemics of poliomyelitis, probably exceeding the number of persons with clinically recognizable infections.

The stable-fly is sometimes, not usually, the factor by which the disease is transmitted.

Flexner and Noguchi cultivated from the central nervous tissues of human beings and monkeys the subjects of acute poliomyelitis, a peculiar minute organism, and with such cultures produced the symptoms and lesions of poliomyelitis.

The micro-organism consists of globoid bodies of extremely small size arranged in pairs, chains, and masses, according to the conditions of growth and multiplication. They were unwilling to express themselves as to the place among living things to which the bodies belonged, but stated that the cultural conditions necessary are those applying more particularly to the bacteria. They were able to produce typical poliomyelitis in monkeys by inoculation with the twentieth generation of cultures from the originally infected animal.

We are still without definite knowledge as to the methods of spread and prevention of the disease.

MEASLES.

Measles was the cause of 44,080 deaths in the registration area for deaths of the United States during the period 1900 to 1910. The number of deaths as compared with those of certain other diseases in the registration area for deaths during 1910 is shown in the following table:—

Disease	Deaths	Deaths per 100,000 population
Diphtheria and croup ...	11,512 ...	21·4
Measles	6 598 ...	12·3
Scarlet fever	6,255 ...	11·6
Whooping cough	6,148 ...	11·4
Cerebrospinal meningitis ...	2,272 ..	4·2
Infantile paralysis ...	1,459 ...	2·7

In 1911, Anderson and Goldberger showed that the monkey is susceptible to infection with measles by inoculation with blood from human cases of the disease. The apparent insusceptibility of the monkey to infection with measles is largely due to a limitation of the period of infectivity of the blood to the very early stages of the disease before or shortly after the appearance of the eruption. Thirty-six hours after the first appearance of the eruption the infectivity of the blood for the monkey becomes greatly lessened and rapidly decreases. Studies on the nature of the virus as it exists in the circulating blood showed that the infective agent is capable in a certain proportion of cases of passing through a Berkefeld filter and therefore is included among the filterable viruses.

Nasal and buccal secretions from human cases collected within the first forty-eight hours after the appearance of the eruption are infective for monkeys by subcutaneous inoculation; this would correspond to about the fourth and sixth days of the disease.

Experiments made to determine the duration of the infectivity of these secretions strongly suggested a reduction if not a total loss of their infectivity with the approach of convalescence. Attempts

* United States Public Health Report, April 3, 1914.

were made, without success, to demonstrate the presence of the infective agent of measles in the "scales" collected from human cases of the disease from four to seven days after the appearance of the eruption.

Koplik spots have been reported in monkeys experimentally infected with measles.

The results of these studies on measles gave the first definite information, based on carefully controlled laboratory experiments, as to the nature of the virus, its means of exit from the body and the probable avenue of infection. The experimental observations on the duration of infectivity of the secretions are in accord with previous clinical observations, that cases of the disease are, as a rule, not infective after convalescence is well established. The great importance of having definitely determined this point, and the further one as to the non-infectivity of the "scales," from a public health aspect can readily be appreciated.

Scarlet Fever.

In 1911 scarlet fever was produced in the lower monkeys, using as a source of infection lymph glands, blood, pericardial fluid, and scrapings from the tongue of scarlet fever patients. A febrile reaction was obtained, attended with an eruption, appearing after a variable incubation period and followed by desquamation of the skin.

Just about the same time chimpanzees were infected with scarlet fever by various methods of inoculation, using blood, emulsion of lymph glands, and deposits from the tonsils of cases of scarlet fever. In two out of four experiments the chimpanzees developed a reaction very striking in its resemblance to scarlet fever in the human being. In the other two chimpanzees the inoculations were followed only by angina without any cutaneous manifestations.

These experimental researches show that the inoculation of material from scarlet fever patients into monkeys is followed sometimes by a morbid syndrome which resembles more or less that of scarlet fever in human beings. Amongst the monkeys the anthropoids appear to present a susceptibility more constant than the lower monkeys.

The disease produced experimentally seems to be caused by the specific virus of scarlet fever, and the streptococcus does not appear to bear any etiological relationship to the disease. If we admit the scarlatinal nature of the infection, which appears very probable, it is then permissible to conclude that the virus of the disease exists in the deposits on the tonsils and tongue, in the blood, the lymphatic nodes, and perhaps in the pericardial fluid. As to the nature of the etiological agent of scarlet fever we are still almost totally without knowledge. It is hoped that further experimental work will result in more definite knowledge as to the etiology and mode of transmission of the disease than that which we have already accumulated.

Typhoid Fever.

Thirty years ago the *Bacillus typhosus* was described and isolated in pure culture.

Grunbaum, in 1906, made attempts to infect chimpanzees with typhoid fever by feeding them pure cultures and also by feeding a portion of the stool from a case of typhoid fever; but his results, while very suggestive, were not conclusive.

In 1911, Metchnikoff, having in mind the history of hog cholera, instead of using pure cultures of the typhoid bacillus endeavoured to infect a chimpanzee with the fæces of a case of typhoid fever containing an abundance of typhoid bacilli. The chimpanzee, eight days after ingestion of the fæcal material mixed with food, developed typhoid fever. The appearance of diarrhœa, the presence of typhoid bacilli in the blood, and the development of specific agglutinins in the blood serum, left no doubt as to the result and clearly showed the susceptibility of the chimpanzee to infection with typhoid fever by feeding.

Apes could not be infected by the feeding and injection under the skin of the fluid obtained by the filtration of typhoid stools. The typhoid bacillus, and not a filterable virus, is the etiological agent in typhoid fever. Lower monkeys are only exceptionally susceptible to typhoid fever, and rodents, such as the rabbit and guinea-pig, are not at all susceptible to infection by feeding.

Neither killed cultures nor their autolysates protected chimpanzees against infection with typhoid fever, but vaccination with living cultures produced an immunity apparently as definite as from an attack of the disease. Vaccination with non-sensitized cultures produced an intense local and general reaction, while sensitized cultures caused only a feeble local and almost no general reaction; both appeared to confer equal immunity to infection. The work fulfils the postulates of Koch as to the etiological relation of the *B. typhosus* to typhoid fever, discredits the theory of a filterable virus in the disease, shows the possibility of absolute protection by vaccination with living cultures, and emphasizes the importance of not relying upon vaccination with killed cultures alone to the exclusion of all other precautionary measures.

Whooping-cough.

In 1900, Bordet reported the observation, in sputum from whooping-cough cases, of a small bacillus, which was not obtained by him in pure culture until six years later, and gave certain reasons in support of his opinion that the bacillus discovered by him was the cause of whooping-cough. Among these reasons was the fact that the bacillus described by him was found only in cases of whooping-cough and was always present in the earliest stages of the disease; another reason being that it was found that the patient's blood serum contained an antibody which was specific for this organism and which could be demonstrated by the complement fixation test.

More recently Mallory has confirmed and extended the findings of Bordet in regard to the etiological relationship of whooping-cough to the bacillus described by the former workers. Mallory found that the primary single lesion in whooping-cough consists of the presence of masses of minute

bacilli between the cilia of the epithelial cells lining the trachea and bronchi. Their action is chiefly mechanical by interfering with the normal movements of the cilia by causing them to stick together, and in this way furnishing a continual irritation, which results in the symptoms peculiar to the disease. Sputum from cases of whooping-cough and pure cultures of an organism corresponding in every way with that described by Bordet produce the same characteristic lesion in young animals and the organism is obtained again in pure culture from those animals.

The action of the bacilli in the respiratory tract would seem to be largely mechanical by their presence in such large numbers that they must interfere with the normal ciliary action and thus with the removal of secretion and of inhaled particles. At the same time, the organism probably produces a mild toxin, which is evidenced by the production of the well-recognized lymphocytosis and by the production of an antibody which is found present in the blood.

The organism is most abundant and most easily demonstrated in the early stages of the disease. This corresponds with the clinical observation that the disease is most readily communicable at that time.

The disease is transmitted by the secretions from the mouth and throat, and is most infectious in the early stages.

Typhus Fever.

The last appearance of typhus fever in the United States in epidemic form was in New York in 1891-92. Since then, except for an occasional case at some of our large seaports, it has been believed that the disease had been eradicated from this country.

It has been a source of wonder to health authorities that, in spite of the occasional arrival in this country of immigrants sick with typhus and of many persons from endemic foci of the disease, typhus fever apparently did not gain a foothold in the United States.

As far back as 1896 Dr. Brill began to notice from time to time among his typhoid cases in New York types that were distinguishable from typhoid and paratyphoid fevers because of the short duration of the fever, the presence of a distinctive eruption, and the absence of specific agglutination reactions. He continued his observations on this type of fever and published two papers based on the study of 255 cases observed up to December, 1910.

About the time that Brill's second paper appeared, Anderson and Goldberger were engaged in the study of the typhus fever of Mexico, and having the picture of that disease clearly in mind, were struck by the very marked clinical resemblance between it and the disease described by Brill.

In September, 1911, they saw a well-marked case of Brill's disease at New York. Blood drawn from the arm vein of this patient was used for the inoculation of monkeys, one of which, nine days after inoculation, developed a fever, which reached its maximum six days later. The fever lasted for eleven days, when it terminated by rapid lysis. Blood was drawn from this animal at the height of its fever and successfully used for the inoculation of other monkeys. Monkeys that have recovered from one attack are immune to subsequent infection. Since then the infection has been carried through twenty-two monkey generations by inoculation of blood, and is now being continued by passage through guinea-pigs.

Having established the susceptibility of the rhesus monkey to inoculation with defibrinated blood from cases of the disease described by Brill, it became important to determine the relationship of that disease to typhus fever, and for this purpose they proceeded to Mexico City, taking monkeys that had recovered from infection with the virus originally obtained from Case No. 1 of Brill's disease, as well as fresh animals for controls.

Brill's disease confers immunity to subsequent infection with Mexican typhus and, conversely, an attack of typhus confers immunity to subsequent infection with Brill's disease. To put it in a simpler way: Brill's disease, so called, and typhus fever are identical.

During the progress of the work necessary for the demonstration of the identity of the so-called Brill's disease and Mexican typhus, attention was given to various problems relative to the mode of transmission. It was found that the New York disease, as also the typhus of Mexico, may be transmitted from monkey to monkey by the bite of body lice that had been allowed to feed on monkeys sick with the disease. These results were in harmony with and confirm those previously reported by them and by others.

They were unable to transmit the disease by the bite of bed bugs or by the inoculation of the buccal and pharyngeal secretions from a human case of typhus. They were also convinced that the only way by which typhus is transmitted is by the bite of the body louse and possibly by that of the head louse.

Now that it is shown that typhus fever is identical with Brill's disease and that Brill's disease has been endemic in the city of New York for a great many years, there is good reason to believe that what is true of New York is true also of other large American and Canadian cities. In fact, since this first work appeared cases have been reported from several cities.

When one recalls how frequently the mild forms of even the familiar infectious diseases are overlooked, it need occasion no surprise that the benign form of a disease, usually thought of as an exotic disease, or at least, perhaps, as a medical curiosity, should fail of recognition. That this is not applicable to typhus alone is strikingly shown by the history of pellagra and of hookworm disease in the United States.

The recognition of these mild forms of typhus is a rational explanation of what Osler has well characterized as a " remarkable feature " of typhus, namely, the occurrence of a few cases at long intervals of time from any other outbreaks and at

great distances from any known foci of the disease. In other words, these mild forms constitute the missing epidemiological link between so-called sporadic cases or outbreaks. In the propagation of typhus this mild form plays somewhat the same rôle that the " missed " or the " carrier " cases do in such diseases as diphtheria and typhoid.

The demonstration of the endemic presence of typhus fever in the United States requires the American sanitarian to recognize the existence of a problem of which he has heretofore been unaware, and to be on his guard against a disease that presumably may at any time assume epidemic prevalence and virulence.

Future advances in our knowledge of the acute infections would seem to depend to a large extent upon the discovery of new methods of staining the etiological agent and of new methods of culture.

It is a singular and regrettable fact that in spite of the large and important additions to our knowledge of the cause and means of transmission of many of the communicable diseases the application of this knowledge in the control and eradication of the diseases has not kept pace with its acquisition. With a few notable exceptions, such as the control of yellow fever through mosquito eradication and of bubonic plague by rat campaigns, health authorities have been slow to apply the great mass of information now available to them by reason of the researches of the last few years.

What is most needed at the present time is a more general application of the results already at hand. Research should, of course, be encouraged and developed; the laity should be impressed with the importance of using the information already available, and very important it is that law-makers should also be made to see that it requires money to carry out the measures for the control of diseases along the lines which have been pointed out so convincingly by laboratory studies.

Translation.

RECRUITING.

THE OLD COLONIAL CONTINGENTS IN FRANCE.

By Dr. REYNAUD.

(*Le Caducée*, April 4, 1914.)

THE young Creoles from the West Indies, Guiana and Réunion were incorporated at the end of 1913 with the Colonial troops in garrison in France. Of a total of 1,560 recruits 386 men of the 1912 class arrived towards the end of October to join 150 recruits of the 1913 class.

On January 8, 1914, at Marseilles 182 out of 386 West Indian recruits were rejected two and a half months after arrival. On January 18, 17 men of those effective had died in hospital, in other words in less than three months a mortality of 48 per 1,000, and a loss of 50 per cent.; the total deaths were more than twenty.

In the middle of January of the total Creoles in France, 1,560 recruits, 28 had died, and 781 were rejected (809 remained), in other words a mortality of 17 per cent. per 1,000, and a gross reduction of 50 per cent. in three months.

The rest of the Creole recruits were then sent to Algiers. This considerable loss of Creole recruits in France on their arrival is due partly to it taking place at the commencement of winter, and this winter was a particularly severe one. No doubt Creoles of 20 years of age suddenly brought into France at the commencement of the cold season suffer physiological troubles to adapt themselves tc a new climatic situation; similar to the physiological troubles encountered by Europeans, especially at a growing age, when transported into the Tropics at the commencement of the hot and rainy season. These troubles of themselves do not create specific diseases, but create a predisposition, a state of receptivity for sporadic and epidemic infectious diseases existing in the country. It is not difficult to understand young Creoles becoming easy prey to infectious diseases pre-existing or introduced into the garrison towns where they are stationed.

This predisposition of young organisms transported to a new station is combined with the fatigue insuperable with the initiation of military service. The observation impresses itself upon all military hygienists that the existence of specific infectious germs in the situation where young soldiers are transported is not the sole cause of development of infectious diseases. The inevitable fatigues of the early instruction of the soldier, the digestive disturbances resulting from the modification of the usual diet, the physiological disturbances of adoption to a town situation, aggravated in the case of the Creole conscripts by the disturbances of climatic adaptation and season adaptation, create that state of least resistance which is above all things the suitable ground for the growth of infectious germs. When troops with this predisposition are introduced into a town where there are typhoid fever, influenza, eruptive fevers, when they are lodged in barracks, where there is a crowding, without being excessive, these favour contamination and epidemic diseases which attack young adults. This is a daily occurrence; it happened to the Creole recruits at Marseilles and elsewhere.

At Marseilles the mortality was particularly severe because, notwithstanding every care, the Creoles were exposed to the numerous diseases which attack civilians and soldiers on arrival in this town. Amongst the causes of death were noticed numerous cases of influenzal pneumonia, typhoid fever, perhaps smallpox, or even meningitis.

As regards typhoid fever, one can state without comment that this disease prevailed amongst all the population. The steamer *Roma* arrived at Marseilles from New York at the beginning of January, 1914, with passengers, 263 of whom were quarantined, because typhoid fever had appeared amongst them. But what is more surprising still is that the Creole conscripts were sent to Marseilles to be there stationed at the very moment when the regiment of Hussars

was sent from the town because it was attacked with typhoid fever. Recruits (French) destined to be garrisoned in the town were temporarily sent to other neighbouring towns to wait for more favourable circumstances, and there to undergo anti-typhoid vaccination. The Creole recruits alone, most susceptible of all, were sent and kept at Marseilles. Can one conclude from this that these men had not the qualities of physical endurance and moral energy which go to make good soldiers? This quest deserves attention when new classes of recruits are about to be called up.

It is only fair and just to remember that during the Mexican expedition the Creole companies of the West Indies and the Creole sailors, who form a large portion of the guard and escort in hot climates—centres of malarial and yellow fever—performed their function perfectly.

Besides in Madagascar in 1895 a battalion of Réunion Creoles hastily raised as soldiers were incorporated in the so-called Colonial regiment alongside of a Madagascar battalion and Haoussa battalion. This regiment, excepting the marines, showed the lowest mortality (154 per 1,000), and nevertheless the soldiers of this troop suffered formidable fatigues. The Chasseurs had 632 deaths per 1,000 men effective. The line regiment had 391 deaths per 1,000 men effective.

The Creoles of the West Indies and of Réunion have no doubt qualities of endurance which render them favourable for service in hot climates. In the condition of the French birth-rate and of the absolute necessity of employing by preference natives of hot climates in tropical expeditions and garrisons, the advantage of the increase of available forces by Creole recruits equivalent to three effective regiments cannot be ignored. How is it possible to utilize to the best national advantage and to safeguard the interests of these contingents? This is a problem which colonial and military hygienists cannot disregard, and facts which justify an expression of opinion upon the question.

Starting with a long established principle that natives of hot climates (meaning the men of the annual levies and not the long service men) give the best return in hot climates, where they serve with a minimum of loss and are employed so as to profit by their native adaptability to hot climates and certain immunity which adults possess against endemic and epidemic diseases such as yellow fever and in certain conditions malaria (having their centres in the countries of which they are natives). Thus for example the West Indian Creoles are better qualified to serve on the West coast of Africa than the Creoles of Réunion which has never been a centre of yellow fever. These are the services which Creole recruits are able to render while freeing a corresponding number of white colonial troops. But to obtain these services it is necessary that these recruits should be incorporated in the colonial army and not in the Zouave regiments, where they are lost to the properly called colonial service; without considering the case of a European war and general mobilization, when they would be required to make a campaign perhaps in winter either on the north-east frontier or on the south-east. Natives of hot climates belonging to the annual levies should be separated from the European regiments.

The utilization of black troops in European wars would be dangerous from a sanitary point of view. Are colonial troops, not having garrisons in Algeria, where the recruits should be collected to have their first year of military instruction, to be finally concentrated for service in hot climates?

To avoid the test of a winter so fatal to them in the south of France and even in Algiers, according to the last information, it is necessary to distribute the recruits in the colonial infantry regiments nearest their country of origin. From Martinique to Guadeloupe and *vice versâ*, from Réunion to Diego-Suarez. After the first six months of military training the West Indians could, at the commencement of April, be collected without sanitary risk in the colonial regiments in the south of France to finish their military instruction in profitable contact with other army corps and from there to be sent to Morocco or West Africa. As regards natives of Réunion, according to circumstances and financial needs they could also be sent to Europe to complete their instruction before going to Morocco, or at Diego-Suarez before going to form a garrison in Madagascar.

For reasons apart from hygiene it appears that military instruction for recruits cannot be completely effective in the immediate neighbourhood of their families.

These proposals, somewhat undeveloped, take account of the variety and conditions of the stations and the needs of the Colonial army. Other solutions can be suggested before hastily starting new experiments or adopting too radical measures which would deprive the colonial army of its important features, but at the same time it would be able to safeguard the sanitary interests of the Creole contingents and thus lessen the effective white troops in hot and unhealthy areas.

THE BRITISH MEDICAL ASSOCIATION.

Programme of Aberdeen Meeting.

The annual meeting of the British Medical Association will be held on July 28 and the three following days at Aberdeen. The proceedings will be opened by the President (Sir Alexander Ogston), who will deliver the presidential address. It is expected that there will be about 1,500 members and visitors present. The popular lecture will be delivered by Professor J. Arthur Thomson on the subject, "Vis Medicatrix Naturæ." The address in medicine will be delivered by Dr. Archibald E. Garrod, and the address in surgery by Sir John Bland-Sutton.

Sectional Meetings.

The scientific business of the meeting will be conducted this year in sixteen sections, in several of

which the programme is still undecided. In the Section of Dermatology a discussion will be opened by Dr. Norman Walker on "The Need for some Method in the Conflict with Lupus and Ringworm." In connection with the Section of Electro-therapeutics and Radiology, Professor Leduc is again attending the meeting of the Association, and will deliver an introductory address on "Cerebral Galvanization." The first day's meeting will be devoted to this and to a discussion on "The Therapeutic Uses of High-frequency Currents." On July 30 Dr. W. Dean Butcher and Dr. John Macintyre will open a discussion on "The Comparative Value of X-rays and Radium in the Treatment of Malignant Growths," and Dr. Agnes Savill and Dr. W. F. Somerville will open a discussion on "Electrotherapy in Neurasthenia"; there will also be a demonstration on "Muscle Testing by Means of Condensers." For the last day of the session discussions have been arranged on "X-ray Diagnosis in Gastro-intestinal Conditions," and with the Section of Medicine on "The Diagnosis of Chronic Pulmonary Tuberculosis."

In the Section of Medical Sociology the following subjects have been set down for discussion: (1) "State Medical Service or Panel System?"; (2) "The Responsibility of the State as regards Venereal Disease"; (3) "The Duty of the State towards the Early Environment of the Child"; and (4) Medical Certification: (*a*) Generally (except Lunacy Certification); (*b*) Under the National Health Insurance Act.

In the Section of Medicine the joint discussion on "The Diagnosis of Chronic Pulmonary Tuberculosis in Infancy and Childhood" is expected to arouse a good debate. The openers are Dr. Barty King, Dr. Clive Riviere and Dr. Ironside Bruce. Sir William Osler, Professor v. Pirquet, Dr. Frank Eve, and, it is hoped, Professor Baginsky, Chief Physician to the Kaiserin Wilhelm Children's Hospital, of Berlin, will take part. The discussion on "Artificial Pneumothorax in Pulmonary Tuberculosis" is to be opened by Dr. Rist, Physician to the Laennec Hospital, Paris. Dr. Clive Riviere is taking part in this discussion, and it is expected that Professor Brauer, of Hamburg, will also contribute.

In the Section of Naval and Military Medicine and Surgery the following subjects have been arranged: (1) "The Treatment of the Wounded in Naval Warfare," to be opened by Fleet-Surgeon D. W. Hewitt; (2) "Gangrene in War," to be opened by Captain C. Max Page; (3) "Salvarsan in the Treatment of Syphilis"; and (4) "Common Ailments in Camp, their Prevention and Treatment," to be opened by Captain Cecil Johnson.

Three discussions have been arranged provisionally in the Section of Ophthalmology. The first, on "The Choice of Cataract Operation," will be opened by Mr. E. E. Maddox; the second, on "The Hygiene of Reading and Near Vision," will be opened by Mr. J. Herbert Parsons; and the third, on "The Teaching of Ophthalmology to Medical Students," will be opened by Dr. Maitland Ramsay.

In the Section of Pathology and Bacteriology several subjects that have recently been prominently before the public have been arranged. On July 29 the President of the Section, Dr. W S. Lazarus-Barlow, will open a discussion on "The Action of Radiations on Cells and Fluids," while another discussion on the same day on "The Importance of Biochemistry in Immunity Reactions" will be opened by Dr. Carl Browning.

On July 31 there will be a joint discussion with the Section of Pharmacology, opened by Dr. Thomas Lewis, on "The Pathology of Heart Function, including the Experimental Pharmacology and Therapeutics of Pathological Conditions of the Heart." On the third day of the meeting Dr. W. J. Penfold will introduce the subject of "The Importance of Variability among Bacteria and its Bearings on Diagnosis."

In addition to the joint discussion with the Section of Pathology on the Heart function, arrangements have been made in the Section of Pharmacology for discussions on "Recent Advances in the Relationship between Chemical Constitution and Pharmacological Activity," and on "The Pharmacology and Therapeutics of the Animal Extracts, exclusive of Thyroid Extract."

In the Section of State Medicine and Medical Jurisprudence the subjects suggested for discussion are as follows: (1) "The State Organization of Medical Service"; (2) "The Legal Investigation of Cause of Death and Possible Reforms"; (3) "Modern Views regarding the Period and Duration of Infectiousness in the Commoner Zymotics"; (4) "Certification of Births and Deaths"; (5) "The Administrative Treatment of Tuberculosis, especially in regard to After-care," in connection with which a paper on "Garden Cities for Consumptives" will be read by Dr. J. E. Esslemont; (6) "Malingering: its Extent and Control," to be opened by Sir John Collie; and (7) "Unqualified Practice: Medical, Obstetrical, and Dental."

The Section of Surgery at one of its meetings will consider a subject to which considerable prominence was given at the recent International Medical Congress under the title "Anoci-Association, or the Evolution of the Shockless Operation," the opener being Mr. H. M. W. Gray. Other discussions are to be opened by Mr. Robert Jones on "The Surgical Treatment of Arthritic Deformities," and by Mr. W. G. Spencer on "The Etiology and Treatment of Carcinoma of the Tongue."

The following discussions have been decided on in the Section of Tropical Medicine: (1) "The Training and Position in Administration of the Sanitarian in the Tropics," to be opened by Colonel King; (2) "The Surgical Treatment of Colitis and Post-dysenteric Conditions," to be opened by Mr. James Cantlie; and (3) "Kala-azar and Allied Conditions." Papers on "Sprue," "Sand-fly Fever," and "Beriberi" have been promised, and others are being arranged for, while a special sub-section of the Museum is being reserved for exhibits in tropical medicine.

Personal Notes.

India Office.

From March 7 to April 18, 1914.

Arrivals Reported in London.—Lieutenant-Colonel J. G. Hajel, I.M.S.; Major W. H. Leonard, I.M.S.; Brevet. Colonel B. G. Seton, *V.H.S.*, I.M.S.; Lieutenant-Colonel F. W. Gee, I.M.S.; Major P. L. O'Neill, I.M.S.; Lieutenant-Colonel P. P. Kilkelly, I.M.S.; Lieutenant-Colonel A. H. Nott, I.M.S.; Captain S. C. Pal, I.M.S.; Major H. Innes, I.M.S; Captain F. F. S. Smith, I.M.S.; Lieutenant-Colonel B. J. Singh, I.M.S.; Major W. H. Dickinson, I.M.S.; Major M. H. Thornely, I.M.S.; Captain A. S. Pridham, I.M.S.; Captain J. Forrest, I.M.S.; Lieutenant-Colonel V. B. Bennett, I.M.S.

Extensions of Leave.—Lieutenant-Colonel R. H. Elliott, I.M.S., 6 m., M.C.; Major E. J. Morgan, I.M.S., 6 m., M.C.; Major F. D. S. Farrer, I.M.S., 1 m. 27 d.; Lieutenant-Colonel J. Jackson, I.M.S., 3 d.; Lieutenant-Colonel C. M. Moore, I.M.S., 3 d.; Captain C. L. Dunn, I.M.S., 5 m., M.C.; Captain G. G. Jolly, I.M.S., 15 d.; Captain G. L. C. Little, I.M.S., 2 m., M.C.; Captain L. Hirsch, I.M.S., 20 d.; Lieutenant P. J. Veale, I.M.S., 5 m., M.C.

Permitted to Return.—Captain N. N. G. C. McVean, I.M.S.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Childe, Lieutenant-Colonel L. F., I.M.S., Bo., 15 m., January 19, 1913.
Duer, Lieutenant-Colonel C., I.M.S., Home Dept., India, 24 m., May 1, 1912.
Hall, Lieutenant-Colonel E. A. W., I.M.S., B., 24 m., October 25, 1912.
Nott, Lieutenant-Colonel A. H., I.M.S., B., 24 m., January 9, 1914.
Steel, Captain R. F., I.M.S , Bo., 24 m., Aug. 2, 1912.
Dickinson, Major W. H., I.M.S., Bo., 18 m., March 1, 1914.
Singh, Lieutenant-Colonel B. J., I.M.S., B. & O.
Thornely, Major M. H., I.M.S., B. & O., 8 m., February 8, 1914.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Gee, Lieutenant-Colonel F. W., I.M.S., to October 22, 1914.
Gibson, Captain H. R. B., I.M.S., to October 5, 1914.
Jolly, Captain G. G., I.M.S., to May 23, 1914.
Leonard, Major W. H., I.M.S.
Mehta, Captain S. B., I.M.S., to November 30, 1914.
Moore, Lieutenant-Colonel C. M., I.M.S., to June 6, 1914.
Pal, Captain S. C., I.M.S.
Seton, Colonel B. G., I.M.S.

Colonial Medical Services.

West African Medical Staff.

Deaths.—D. Mackinnon, M.B., Ch.B.Edin., D.P.H.Edin., D.T.M. & H. Cantab, Medical Officer, Nigeria; C. B. Hunter, M.B., C.M.Glas., Senior Medical Officer, Gold Coast.

Transfers.—G. F. Forde, L.R.C.S., L.R.C.P.Edin., L.F.P.S. Glas., Medical Officer, has been transferred from the Gold Coast to Nigeria; J. A. Harley, M.B., Ch.B.Edin., and S. L. Brohier, M.R.C.S.Eng., L.R.C.P.Lond., Medical Officers, have been transferred from the Gambia to the Gold Coast; J. C. Franklin, L.R.C.S. & P.Edin., L.F.P.S.Glas., Medical Officer, has been transferred from the Gambia to Nigeria; G. Rollason, L.M.S.S.A.Lond., Medical Officer, has been transferred from Sierra Leone to Nigeria.

Resignations.—A. Lundie, M.B., Ch.B.Edin., B.Sc. St. Andrews, Medical Officer, Gold Coast; E. J. Wyler, M.D., B.S.Lond., L.R.C.S.Eng., L.R.C.P.Lond., Medical Officer, Nigeria; A. Hutton, M.B., Ch.B.Aberdeen, D.T.M. & H. Cambridge, Medical Officer, Nigeria.

Retirement.—A. Bremner, M.B., C.M.Edin., D.T.M. Liverpool, Medical Officer, Sierra Leone, retires on pension.

New Appointments.—The following gentlemen have been selected for appointment to the staff: T. P. Fraser, M.B., Ch.B. Aberdeen, D.P.H.Cambridge, Nigeria: A. S. Burgess, M.R.C.S. Eng., L.R.C.P.Lond., M.B., B.C.Cambridge, Gold Coast.

Promotions.—The following promotions in the staff have been made since January 1, 1914: T. Hood, M.R.C.S.Eng., L.R.C.P.Lond., Principal Medical Officer, Nigeria, Southern Provinces, to be Director of the Medical and Sanitary Service of Nigeria; E. A. Chartres, F.R.C.S.Ire., L.R.C.P., L.M.Ire., D.P.H.Ire. F.R.G.S., Senior Medical Officer, Gambia, to be a Senior Medical Officer (Grade 1), Nigeria; C. R. Chichester, M.B. Dublin, L.R.C.P. & S.Ire., D.P.H.Ire., Provincial Medical Officer, Southern Nigeria, to be Senior Medical Officer (Grade 1) Nigeria; W. H. G. H. Best, L.R.C.S. & P.Ire., Provincial Medical Officer, Southern Nigeria, to be a Senior Medical Officer (Grade 1), Nigeria; C. F. Watson, M.R.C.S.Eng., L.R.C.P. Lond., D.P.H.Ire., D.T.M.Liverpool, Senior Medical Officer, Northern Nigeria, to be Senior Medical Officer (Grade 2), Nigeria; W. H. A. Gordon-Hall, M.B., C.M.Edin., Senior Medical Officer, Northern Nigeria, to be a Senior Medical Officer (Grade 2), Nigeria; W. I. Taylor, M.R.C.S.Eng., L.R.C.P.Lond., Senior Medical Officer, Northern Nigeria, to be a Senior Medical Officer (Grade 2), Nigeria; H. P. Lobb, M.R.C.S.Eng., L.R.C.P. Lond., D.P.H.Ire., Medical Officer, Northern Nigeria, to be a Senior Medical Officer (Grade 3), Nigeria; M. E. O'Dea, M.B., Ch.B.Edin., Medical Officer, Southern Nigeria, to be a Senior Medical Officer (Grade 3) Nigeria; W. W. Claridge, M.R.C.S. Eng., L.R.C.P.Lond., Medical Officer, Gold Coast, to be a Senior Medical Officer (Grade 3), Gold Coast; A. E. Horn, M.D., B.Sc.Lond., M.R.C.S.Eng., L.R.C.P.Lond., D.T.M. & H.Cambridge, Personal Assistant to the Principal Medical Officer, Southern Nigeria, to be Senior Medical Officer (Grade 3), Gambia; J. M. Dalziel, M.D., C.M.Edin., B.Sc. Public Health, Edin., Medical Officer, Northern Nigeria, to be a Sanitary Officer, Nigeria.

Other Colonies and Protectorates.

N. S. Williams, M.R.C.S.Eng., L.R.C.P.Lond., has been selected for appointment as a temporary Medical Officer in Uganda.

J. H. Paterson, M.B., D.P.H., has been selected for appointment as a Supernumerary Medical Officer in Jamaica.

C. H. Sills, M.R.C.S.Eng., L.R.C.P.Lond., has been selected for appointment as a Supernumerary Medical Officer in the Leeward Islands.

S. Vassallo, D.M. & S.Malta, has been selected for appointment as a Supernumerary Medical Officer in the Leeward Islands.

W. A. S. George, L.R.C.P. & S.Edin., has been selected for appointment as a District Medical Officer in St. Vincent.

H. P. Hacker, M.D., B.S., B.Sc.Lond., has been selected for appointment as a Supernumerary Medical Officer in the Federated Malay States.

Colonial Medical Service.

Dr. K. McGahey, Medical Officer of Nigeria, Northern Provinces, has been transferred to the Medical Department of Ceylon.

Dr. H. L. Duke, Medical Officer in the Uganda Civil Service, has taken up the duties of Bacteriologist in the Medical Department.

Dr. C. H. Sills has been appointed Supernumerary Medical Officer in the Leeward Islands, to be stationed in Dominica until further orders.

Dr. A. C. N. McHattie, Chief Medical Officer, Bahamas, has become Acting Colonial Surgeon of that Colony.

Dr. G. Rollason, Medical Officer, Sierra Leone, has been transferred to the Government of Nigeria.

"Journal of the American Medical Association," April 20, 1913.

Typhoid Carriers.—Removal of the gall-bladder and cystic duct as a method of clearing up chronic typhoid carriers, by Dr. Leary, although founded on a basis of a certain degree of scientific justification, has not widely recommended itself.

Original Communications.

EMETINE TREATMENT OF DYSENTERY IN YOUNG CHILDREN.

By Captain R. G. ARCHIBALD, M.B., R.A.M.C.
Pathologist, Wellcome Tropical Research Laboratories, Khartoum.

NUMEROUS papers have lately been published referring to the therapeutic value of emetine in amœbic dysentery affecting adults, but few cases, however, have so far been described recording the use of the drug in the treatment of this disease in children.

The writer has recently had the opportunity of employing emetine in two cases of amœbic dysentery in young children, where the causal agent was *Löschia tetragena* Viereck, 1907 (*Entamœba tetragena*). The results obtained were interesting, and were considered worth recording, for in the one case the entamœbæ appeared to have considerable resisting properties towards the action of emetine, while in the other the amœbicidal properties of the drug were well shown.

Case A was an English girl, aged 2 years 4 months. Shortly after her arrival in Khartoum she had an attack of diarrhœa, vomiting and pyrexia.

The stools were pale and pultaceous in character, and contained a little mucus, but no blood.

Microscopical examination showed the presence of large numbers of bacilli, but no entamœbæ were found. Portions of the stools were plated out with negative results as regards the presence of organisms of the *Bacillus dysenteriæ* group.

A grey powder was administered, and the patient's diet limited to albumen water. The symptoms quickly abated, and the child was soon well again. Ten days later she became ill with fever, abdominal pain and diarrhœa, and passed a large amount of blood and mucus in her stools. A specimen of the latter was examined microscopically and found to contain large numbers of active entamœbæ. These, on further examination, were proved to be *E. tetragena*. Plating of the stools on suitable media showed that no organisms of the *B. dysenteriæ* group were present. Examination of the peripheral blood of the patient eliminated a malarial infection, although it was noted that there was an increase of the large mononuclear leucocytes. A dose of castor oil was administered, followed two hours later by a grain of Dover's powder. The latter was given every hour till six doses had been given.

The symptoms, however, did not abate, for the child passed twenty-three motions during the next twenty-four hours. Minute doses of perchloride of mercury were then administered, as recommended by Houston,* but without beneficial result, and it was then considered justifiable to employ rectal lavage with 1 in 10,000 quinine solution. This had no effect in alleviating the symptoms.

In the evening $\frac{1}{8}$ gr. emetine hydrochloride was injected intramuscularly, followed twelve hours later by a second injection of $\frac{1}{8}$ gr., and twelve hours later by a further injection of $\frac{1}{8}$ gr. The patient's symptoms showed no signs of improvement, for twenty-nine motions, containing a large amount of blood and mucus, were passed in the twenty-four hours. Examination of the mucus showed that active entamœbæ were still present.

As the emetine appeared to have no effect in limiting the number of motions, half a minim of Battley's solution was administered by the mouth, with the hope of checking the peristaltic action of the bowels. To a certain extent this was successful, but in the meantime the patient's condition had become somewhat grave, and there was danger of heart failure. Three ounces of sterile normal saline were injected into the intracellular tissue of the thorax, with a marked beneficial effect; for the pulse and general condition of the patient rapidly improved. Thirteen evacuations occurred during the next twenty-four hours; some of these were examined, and still found to contain blood mucus and living entamœbæ. The patient's temperature remained fluctuating between 100° and 102° F. Another injection of $\frac{1}{8}$ gr. emetine was administered, making a total of $\frac{1}{2}$ gr. in forty-eight hours. No further emetine was administered till thirty hours afterwards, when another $\frac{1}{8}$ gr. was given.

The temperature continued to fall, and the patient's stools showed some improvement in character. Very few entamœbæ were found, and these were chiefly in the form of cysts.

It was considered advisable to administer a purge for the mechanical removal of these cysts, and then follow this up by injections of $\frac{3}{8}$ gr. emetine within the next twenty-four hours, and subsequent daily injection of $\frac{1}{8}$ gr. The patient suffered no after-effects, the temperature, apart from two slight evening rises, remained normal, and the frequency of the motions was daily lessened. No entamœbæ were found on the twelfth day following the onset of the illness, nor were they found again in the examinations carried out for the fourteen days.

Apart from a slight rise of temperature on the twentieth day, which was combated by $\frac{1}{6}$ gr. emetine given in a single injection, the patient made an uninterrupted recovery, and soon regained her usual health.

The total amount of emetine administered during the course of her illness and convalescence was *two and one-sixth* grains.

Case B was a girl, aged 8 months, the younger sister of the above described case. For two days this child had suffered from colic, and on the third day a small amount of blood and mucus was passed with a loose and yellow stool. There was no pyrexia. Microscopical examination showed large numbers of *E. tetragena* present. A dose of castor oil was administered, and two hours afterwards $1\frac{1}{2}$ gr. emetine injected intramuscularly. The number of stools passed that day was six, and most of them contained mucus and a little blood.

Another injection of the same amount of emetine

* Houston, M., "Care of European Children in the Tropics," 1912.

was given the following day. Examination of the stools revealed only a few entamœbæ and no cysts. Two more daily injections of emetine, $\frac{1}{12}$ gr., were administered. Examinations of the stools from this patient were carried out for several successive days, with negative results as regards entamœbæ or their cysts. She made an uninterrupted recovery and regained her usual health.

Remarks.—Reference has already been made to the paucity of literature dealing with the use of emetine in the treatment of amœbic dysentery in children, and the main object in recording these two cases is that some guide may be given to the practitioner in the Tropics regarding the dosage of this specific drug for very young children. Case A was a severe infection, and was illustrative of the delayed effects of emetine, and the extremely resistant properties of the entamœbæ towards this drug. Even after a total of $1\frac{1}{2}$ gr. of emetine administered intramuscularly, living entamœbæ were present in the patient's stools. Bearing in mind the age of the patient, this result was hardly to be expected in the light of what has recently been written regarding the active amœbicidal properties of this drug, and one draws the conclusion that in such a severe case the amount of emetine administered in the early stage of the illness was too small. Instead of a destructive effect being exercised on the entamœbæ, the latter may have become to a certain extent "*emetine fast*" as the result of insufficient dosage. During the last six months several opportunities have occurred of noting the effect of emetine in adults suffering from amœbic dysentery; in many of these cases the entamœbæ were often found in the fæces even after the total amount of emetine administered had equalled five or six grains, and recently the writer has had under observation a case where the patient's dysenteric symptoms continued, and entamœbæ were present in the fæces after a total amount of 10 gr. of emetine administered hypodermically in doses of 1 gr. *per diem*. That no other causal organism was present to account for this was proved by the fact that the fæces were frequently plated out so as to eliminate the possibility of a concomitant infection with either Shiga's or Flexner's bacillus. This patient eventually left hospital, having received a total amount of 14 gr. of emetine.

Malaria may also be cited as a disease where the causal plasmodium frequently exhibits considerable resistant properties towards its specific drug. For, in the Sudan the writer has known of cases where, to all intents and purposes, the plasmodium has shown a considerable degree of immunity towards the ordinary methods of quinine administration. These have invariably occurred in individuals indulging in insufficient prophylactic doses of quinine prior to their illness. This insufficient prophylaxis doubtlessly held the symptoms of malaria in abeyance, and instead of destroying the causal parasites rather assisted their resistant properties towards quinine. Such a view, of course, is purely hypothetical, but appears applicable to those cases of amœbic dysentery which fail to respond to the action of emetine in the amounts usually employed. On the other hand, there may be some stage in the life cycle of Löschia which is particularly susceptible to the action of emetine, and this may account for the somewhat inconsistent results that have occurred with the use of this drug in the treatment of amœbic dysentery in the Sudan.

Further research requires to be carried out to ascertain the dosage limitation of this drug. From observations made the writer is inclined to consider that the dosage ordinarily employed is too small. It may be that in the Sudan a particular resistant strain of entamœba is met with, certainly the common pathogenic species usually encountered corresponds to the description of *E. tetragena*.

From what has been said it is quite apparent that in order to efficiently treat a case of amœbic dysentery with emetine one must rely on the evidence obtained by frequent microscopical examination of the fæces. One's experience has shown that failure to find entamœbæ on the first examination does not preclude the possibility of their being present. Their detection is readily assisted by a preliminary purge being given to the patient. Further, an absence of pyrexia is no contra-indication to an examination of the fæces being carried out. This point was well illustrated in Case B, where the temperature remained normal during the patient's illness.

More information is required regarding the length of time that emetine should be administered in order to prevent dysenteric relapses occurring. This, no doubt, will be forthcoming when a further knowledge of the life cycle of the entamœbæ is gained.

Case A remained fit and well for a period of nine weeks, during which no emetine was administered. In the tenth week, however, some mucus was passed. Microscopical examination of this showed that large numbers of entamœbæ and their cysts were present together with a slight amount of blood. A dose of castor oil was administered, followed four hours later by an initial injection of $\frac{1}{6}$ gr. emetine, and this injection was repeated again in twelve hours, and again in another twenty hours. A total of $\frac{1}{2}$ gr. was thus given in thirty-six hours with excellent results, causing a complete disappearance of the symptoms and the entamœbæ and their cysts. There can be little doubt that this was a true relapse, and not a fresh infection, and in view of this the writer is inclined to suggest that emetine should be continually administered either once a week or once a fortnight for at least a period of three months after the patient's apparent cure.

Leonard Rogers* in his recent work, entitled "The Dysenteries," discusses the question of radical cure of amœbic dysentery by emetine injections, and states that "the evidence, as far as it goes up to the time of writing, points to the conclusion that we have in the emetine treatment a permanent as well as a rapid curative procedure."

One's experience in the Sudan has not been wholly in accordance with that of this distinguished observer, and more evidence is required regarding the permanent

* Rogers, L., "Dysenteries," 1913.

results obtained by the use of this drug. The question is one of paramount importance, as it is closely associated with the "carrier" problem.

Characters of the Entamœbæ. — Reference has already been made to the species of entamœbæ found in the two cases described above. The entamœbæ were examined in the fresh state, and their cytological characters studied in preparations stained by Leishman, and by the iron hæmatoxylin method. They corresponded in detail to *E. tetragena*. Two healthy kittens were injected *per rectum* with 3 c.c. of fresh fæces containing active entamœbæ. Both kittens developed dysenteric symptoms with entamœbæ in their stools, and died within four days. Their large intestines showed signs of enteritis. In one kitten the liver was intensely congested, but no evidence of abscess formation was present.

Source of Infection.—Contaminated water is apparently the chief source of infection. In spite of the excellent water supply in Khartoum, Europeans are occasionally infected, probably as the result of partaking of uncooked vegetables washed in contaminated water or handled by infected individuals. In Cases A and B it was difficult to trace the source of infection. The fæces of all the immediate contacts were examined, but with negative results as regards the finding of entamœbæ. One may here refer to an important preventive measure rarely adopted in the Tropics, viz., the advisability of having the fæces of all native servants examined before taking them into employment. This is particularly desirable where young children are concerned.

Method of administering Emetine Hydrochloride.—The writer's experience has been entirely limited to the intramuscular and subcutaneous methods of injection. Of the two, the former appears to be more preferable, particularly in patients whose vitality has been somewhat lowered. Recently, in one case, a local and painful fibrosis developed over the sites of subcutaneous injections, and in another instance a local necrosis occurred. A point of interest noted in some of the blood of these dysentery cases treated by emetine hydrochloride was the appearance of an eosinophilia. It may be as well to state here that the brands of emetine employed have been prepared by a well-known English and also Italian firm.

Conclusions.—The main point in this paper may be briefly summarized.

(1) Young children are extremely tolerant of the drug emetine. In severe cases of entamœbic dysentery it is advisable to commence with an initial dose of $\frac{1}{8}$ gr. for a child of 2, and repeat this dose every twelve hours, till a total of $\frac{1}{2}$ gr. has been given.

(2) The total amount of emetine administered should be controlled by the evidence obtained by microscopical examination of the stools, a procedure which should also be carried out at intervals during convalescence.

(3) In order to avert relapses, the continued treatment by emetine after the patient's apparent recovery from dysentery would be advisable.

(4) In entamœbic dysentery of the Sudan emetine may require to be given in larger doses than are usually employed in other countries.

RECOVERY OF EMBRYO OF *FILARIA BANCROFTI* FROM BLOOD FROM THE LUNG DURING DAYTIME.

By Major B. H. Dutcher.

Medical Corps, United States Army, San Juan, Porto Rico.

A soldier of the Porto Rican Regiment entered the hospital February 16, 1914, suffering from a mild attack of whooping cough, then prevalent. Between 9 a.m. and 10 a.m., February 20, 1914, during a paroxysm he coughed up a small quantity of pure blood, embedded in mucus.

Upon examining as much of this blood as I could disentangle, probably the equivalent of a small drop, I found that it contained five or six moderately active microfilariæ. In lifting off the cover slip in order to preserve the specimen all were lost but one. The slide with the survivor is now in the collection of the Army Medical Museum at Washington.

While this is not surprising in view of our knowledge of the diurnal habitat of *Microfilaria nocturna*, it is, I believe, the first time that the worms have been obtained from the lungs in the living subject.

PELLAGRA IN NEW ZEALAND.

At the recent session of the Australasian Medical Congress in Auckland, Dr. G. B. Sweet exhibited a child, aged 4, from Westport, which was supposed to be a case of pellagra, though it is stated the diagnosis was not definitely confirmed. Dr. C. E. Maguire reported a female patient, aged 44, who was suffering from pellagra. These are the only two known cases of the disease in New Zealand at the present time, and no cases had been previously reported in that Dominion.

SMALL-POX IN GREAT BRITAIN AND GERMANY.

In the twenty years from 1889 to 1908 England and Wales had seven and a half times the small-pox mortality of Germany, and proportionate to the population thirteen times; and this in spite of the fact that England is distinctly in advance of Germany in the matter of general sanitation, as proved by the fact that her general death-rate has been, and still is, considerably lower; that the special sanitary measures for the suppression of small-pox, viz., the notification, isolation, quarantine of contacts, and disinfection, are more rigorously carried out in England than in Germany, and that England, by her insular isolation, enjoys a great advantage over Germany, which is bordered by several countries in which small-pox is almost always present. "The only reasonable solution," says the report of the Pennsylvania State Medical Commission, which has just finished a two years' study of vaccination, "is that Germany has more rigid and better administrated vaccination requirements."

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 1, 1914.

SOME ASPECTS OF SURGERY IN THE TROPICS.

AT the meeting of the Society of Tropical Medicine and Hygiene, on May 19, 1914, a paper was read by Mr. Cantlie, on "Some Aspects of Surgery in the Tropics." The subject of surgery in tropical work is one that is apt to be neglected in the overwhelming interest in, and attention paid to, the more fascinating subjects of new discoveries of many kinds in the field of bacteriology, helminthology, protozoology, &c. We send the young medical man to the tropical field nowadays equipped in laboratory work in a way which is a credit to the medical schools and a great comfort to the men who are going out; but the prospect of having to undertake major operations straightway on taking up duties abroad, is often but little short of a nightmare to a young man of say, four-and-twenty who has never had the opportunity of doing serious operations before leaving England. How to overcome this shortcoming in training is a difficult problem to solve. A "clinical school of operative surgery," as Mr. Cantlie intimates, may be theoretically an excellent idea, but the practicability of its establishment is another matter. Practising on the dead body, no doubt, helps much, and such stereotyped operations as amputations, excision of joints, ligature of arteries, &c., may be fairly well learned thereby, but even these very operations on the living body is a very different matter. Muscles do not retract in the dead body when cut, hæmorrhage does not confuse, the skin remains flabby, and the expert teacher on the dead body may himself be an unskilful operator clinically. How much more is this the case when less "set" operations, such as those demanded in abdominal or brain troubles, have to be done. The answer usually to all this is that every man before going abroad to practise should have been a house surgeon in a hospital. This may be impossible, for there are more candidates than vacancies for these appointments, and, moreover, the house surgeons, especially in our large hospitals with medical schools attached, seldom or never get any of the operations to do that come to the table in the operating theatre. This is a pity, no doubt, but it is inevitable, and the house surgeon at the end of the time may have been trained to become a first-rate dresser, but untrained to take the responsibilities of operation upon his own shoulders. However, as pointed out in Mr. Cantlie's paper, the records of recoveries after operations in tropical hospitals, under European, or European trained medical men, compare satisfactorily and in some cases advantageously with those results published by the hospitals in Britain.

It is difficult to compare the two seeing the differences in environment, in the racial peculiarities, in the matter of the option of selection of cases, and many other circumstances. Two sets of operations were selected, not so much as a test of skill, but as a means of estimating the care devoted to asepsis. In the matter of the radical cure of hernia (not strangulated hernia) the returns from twelve tropical districts ranging from the West Indies to the Far East in one year 226 cases of hernia were operated upon with one death; whilst in one of the largest London hospitals 441 cases were operated on with three deaths. That statistics of the kind are apt to mislead we well know, for in the same London hospital in the year following the one from which the record above stated was chosen in over 400 cases no death took place. Yet the results show that asepsis is quite readily accomplished in tropical hospitals where the nursing is often entrusted to natives and sterilizing is therefore more likely to be dubious. All the more credit, therefore, is due to the assiduous care taken by the surgeons in the Tropics. The mortality after amputations was the other surgical

test applied by the writer of the paper in question, and it showed that in twelve widely apart tropical countries, of 665 major and minor amputations, including 76 through the thigh, performed in tropical countries there were only 15 deaths, whereas in twelve years in hospitals in Britain there were 580 amputations performed, including 63 thighs, with 182 deaths. Here again statistics are dubious as tests of efficiency, for in the home hospitals amputations through the hip-joints were numerous, whereas this operation is not mentioned in tropical hospital returns. Another factor which annuls accurate comparison is that in Britain amputations are often called for in cases of accidents which afford but a slender chance of recovery compared with those performed for disease. In the tropical colonies where railway, tramway, and motor accidents are few; where factories, mining, ship building and docking are comparatively infinitesimal compared with British industries, the accidents are therefore usually more trivial than those met with in Britain. However, the good results recorded in tropical countries show that successful surgery is possible, and therefore encouraging to the young surgeon about to take up work there.

The racial differences were pithily summed up by Mr. Cantlie in his statement: "In the case of the native the danger is on the operating table; in the case of the European it is after the operation that danger arises." He explained that the native suffers from shock to a greater extent than the European, consequently the effect of the operation is more serious in his case; but the European, owing perhaps to a more plethoric constitution induced by several causes, suffers "constitutionally" later on. As regards anæsthetics it would seem that they do not cause the surgeon the anxiety they do in Britain. Chloroform is the favourite anæsthetic in warm climates and there seems no reason to think that it will be supplanted. A sufficiency of air is the chief necessity for the safety of chloroform-giving, and in tropical operating theatres or rooms there is plenty, for we find ourselves practically in the open air. In Europe owing to the present dread of the entrance of "septic" air, the operating theatres are close and deaths from chloroform are not unheard of. Other anæsthetics in the Tropics are less convenient; the old method of administering ether with its indiarubber bag and other rubber appurtenances are at a discount, not on account of the gas itself, but on account of the serious effects of a tropical climate and the rubber materials; the recent method of giving ether by the open method is not in vogue to any great extent in the Tropics, owing to the difficulty of getting the patient under, due to the rapid evaporation of the ether, and the necessity of stopping the punkah or shutting several windows to lessen the freedom of the current of air. Not only does the heat necessitate open windows, but also the presence of the punkah over the operating table; this causes annoyance, as it delays the patient's going under the anæsthetic, and is also apt to cause chilling of the contents of the abdomen if a laparotomy is being performed; on the other hand, should the punkah be stopped, the operator is horrified to find the sweat from his face dripping into the peritoneal cavity of the abdomen he has opened. These and many other points arise in operating theatres in tropical countries which show that there are environmental difficulties which at first seem alarming but which soon disappear.

Mr. Cantlie dealt also with liver abscess operation, with the surgical possibilities in the case of diseases of the colon, with splenectomy as a rational method of treatment in certain ailments connected with the spleen, and brought forward in each instance, practical examples of the difficulties the medical man in the Tropics has to encounter, more especially when single-handed.

THE BRITISH ASSOCIATION MEETINGS IN AUSTRALIA.

The eighty-fourth annual meeting of the British Association for the Advancement of Science will be held in Australia during July and August. The arrangements include visits to all the States, excepting Tasmania. An advance party, limited in number, will visit Western Australia for scientific field work. They are expected to arrive at Perth on July 21 or 28, and, after a reception at Government House and an evening discourse by Professor Herdman, F.R.S., they will visit the goldfields and other districts, in the interests of the various sections—geology, zoology, and botany. The main party is to arrive at Fremantle on August 4, and, with the Western Australian contingent, will proceed to Adelaide, where, on August 10, after two days of receptions and sight-seeing, Sir Oliver J. Lodge (Retiring President) will deliver his address. Sectional meetings (geography and agriculture) will be held on August 12, at which Sir Charles P. Lucas, K.C.B., and Mr. A. D. Hall, F.R.S., will deliver addresses. On Thursday, August 13, Melbourne is to be reached, where the party will be received by the Commonwealth Government, as well as by the city authorities. On the evening of the 14th, Professor W. Bateson, F.R.S., will assume the Presidency of the Association, and will deliver the first part of his address, the second part being given at Sydney on the 20th. Arrangements are being made for receptions and excursions in all the States, so that the members of the Association may have the opportunity of meeting representatives of the various governments, the municipalities, the universities, the churches, and the societies interested in education, art, and science throughout the Commonwealth.

Abstracts.

TESTICULAR NEURITIS FOLLOWING GONORRHŒAL EPIDIDYMITIS.*

By Shu Yoshida.

Neuritis after gonorrhœal inflammation of epididymis occurs a few days or weeks after subsidence of inflammation.

It may appear in various forms: A feeling of testicular distension, a feeling of carrying a foreign body, a feeling of pricking pain, lumbar pain, a pain along the inner side of thigh. These pains may come continually or at intervals, and may disappear without any treatment, but in many cases it appears after a temporary cure and is generally caused by connection or travelling.

Among the author's cases, the most remarkable was one in whom the pain continued at intervals for six years.

History of the case: Male, aged 33. Suffered from gonorrhœa with left epididymitis six years ago and was completely cured in six weeks. Since that time he suffered from pain two or three times every month, and it was generally severe the day after connection or after travelling. Three children were born after that time. This year he again suffered from gonorrhœa and was completely cured, but the pain still continues. Urine was quite clear with only one or two flakes, and no gonococcus was recognized. *Per rectum*, the prostate had two bean-sized nodules on the right side and the patient was said to have a comfortable feeling on massaging the prostate. The left spermatic cord was generally enlarged, and the testicle was hard and the size of an index finger, but they both had no tenderness.

Finally, the author says that the neuritis may accompany or follow other diseases of the genito-urinary system.

SOME CASES OF PELLAGRA OCCURRING AMONG THE INSANE IN SOUTH AFRICA.†

By E. W. D. Swift, M.B., and H. Egerton Brown, M.D.
Bloemfontein.

We have frequently seen cases of a recurrent hæmorrhagic superficial eruption on the backs of the hands and shins of natives, which, on healing, left a glazed or cracked surface, but these were looked upon as an erythema due to the effects of the sun. Some of these were cases of mild pellagra. The cases we report in this article are of a much more severe type and typical of the disease as described in Italy and America.

Dr. M. M. MacFarlane, Leribe, Basutoland, states that he attended five cases of pellagra among Basutos in 1906-07, and he ascribes the cause to the maize being reaped that year in very rainy weather, and having to be stored in a damp condition.

One would imagine that, as the staple diet of the South African native is maize, this disease would be extremely common among them, but possibly owing to the grain being usually reaped and stored during the dry season it is not so likely to become diseased as elsewhere.

The disease in other countries occurs in the spring and reaches its height in summer. In this country we have noticed its appearance in the late autumn and winter.

Patient S. M., Basuto, aged 40, admitted on August 18, 1912. Physical examination on admission showed the patient was poorly nourished; the skin of the face was darkly pigmented and dry, and there was a herpetic eruption on the lips; the gums were swollen and spongy; the knee-jerks were exaggerated, and slight ankle clonus was obtained. Mentally he was morose and unsociable, often restless at nights; hallucinated, stating that people, whom he is unable to see, come into his room and strike him.

The following notes occur in the Case Book, September 19, 1912: Developed some superficial ulcerations of flexures of elbows and front of legs.

September 26.—Ulceration has extended over front of legs and elbows. He is weak and has some dysenteric diarrhœa. Skin of face and limbs is icthyotic, thickened, scaly and coal black. The appearance is suggestive of pellagra.

October 8.—Ulceration is healing.

October 25.—Ulcers have healed, but he has again become excited and deluded; conversation is incoherent, and he is restless at nights.

The above attack showed the majority of the signs and symptoms of pellagra and the recurrence which occurred this year practically placed the diagnosis without doubt.

On June 5, 1913, it was noticed that the skin in front of shins had assumed a more glazed appearance; this also appeared to a lesser extent on the skin of chest and, very slightly, of face. A few days afterwards the skin of legs began to become very dark, practically as black as coal; this was followed by cracking, the cracks only extending down to the true skin. By the 16th bullæ had formed with a fair amount of serous exudation; in places a few pustular areas could be seen, these being probably due to some external infection. This was followed by desquamation, and sores developed extending down only to the upper layers of true skin; in fact, the front of the leg was one large superficial sore. That the true skin was not affected was proved by these healing without leaving any scar. About this time the neck and chest became affected and went through exactly the same stages as the above. About six weeks after the first bulla formed the eruption gradually healed, leaving pigmented areas.

The other physical signs were diarrhœa of a typhoid nature which improved under quin. sulph. 5 gr. t.i.d. His reflexes were markedly increased, those of the facial area being most marked, a tapping in front of ear led to a spasmodic reflex of that side of face, twitching of mouth and nostril by tap-

* From the *Sei-i-Kwai Medical Journal*, March 10, 1914.
† From the *Medical Journal of South Africa*, March, 1914.

ping under zygoma and on gently striking face the corners of mouth twitched. His legs became much atrophied and the plantar reflex tended to be extensor.

The history of the disease as gathered from the patient was as follows: The eruption appeared about four years ago when he was in Basutoland. It was identical with, only not so serious as, the above described. It was preceded by a period of headache and general lassitude, pain in abdomen and diarrhœa. Mouth and throat felt dry, and this was followed by the eruption which affected his arms, legs, face and chest (parts exposed to the sun). After about two months the eruption passed off and he felt much better, but he noticed that his arms and legs were thinner and weaker and that he had some difficulty in walking. The above is his fourth attack, all of which have occurred in late autumn or winter. This has been the case in all our patients, and appears to be a point of difference between pellagra occurring here and in other countries: in the latter it is a disease of spring and summer.

Another case was that of a Zulu, aged about 30, admitted to the asylum in February, 1909. The mental condition of this patient was one of pronounced dementia. He was apathetic and unable to give any information about himself and showed no initiative or interest in his surroundings. He remained in this state with occasional temporary exacerbations until his death in April of this year. It was impossible to obtain any history of his illness owing to the patient's mental condition.

May 12, 1910.—Has developed an erythematous rash on left side of neck and front of chest. This is desquamating and discoloured in parts and appears similar to the rash which occurs in pellagra. Hands and legs show some œdema. Gums pale but firm, knee-jerks exaggerated. Patient is profoundly stupid and dirty in his habits.

July 12, 1910.—The skin has desquamated over above rash, leaving a dark stain. Always slobbering, wet and dirty; lies crouched up in bed and resists any movement, active or passive: is profoundly demented. Provisional diagnosis pellagra.

Subsequent notes describe the recurrence of a similar condition of the skin and an attack of dysenteric diarrhœa in the winter of 1912.

The distribution of the rash was confined to the exposed parts of the skin. It appeared first in patches of hyperæmia followed by desquamation and, in parts, by superficial ulceration exposing the cutis vera. The hyperæmia and ulceration gradually subsided leaving a dark-coloured pigmentation of the affected areas, more pronounced at the margins, and the skin in an atrophic and inelastic condition.

During the last eight years about six cases presenting similar symptoms have been observed among the native patients in the Bloemfontein Asylum.

The characteristic appearance of the skin, including the subsidence and subsequent recurrence of the rash, has usually been accompanied by attacks of diarrhœa and progressive debility of mind and body.

INFANT MORTALITY IN THE PHILIPPINE ISLANDS.*

By W. E. Musgrave.

Infant mortality in Manila is greater than it is in any other city from which we have records. This excessive mortality is not due to a single cause, and it is not due to natural conditions of the country. It is due to a multiplicity of artificial causes that may be classified into: Predisposing causes, pre-natal and post-natal, and immediate or active causes.

A thorough study of the predisposing causes of infant mortality necessitates careful investigation of the mentality, financial responsibility, social and political economy of the people, the sanitary conditions—including character and quality of medical attendance — conditions of childbirth, general hygiene, personal hygiene, habits, vices, and customs of the race. In this connection, also, must be considered the influence of heredity, with particular reference to tuberculosis, syphilis, and other diseases transmitted directly or indirectly through generations—in other words, the eugenic estimate of the race.

Of the more direct influences bearing upon the prospects of the child after birth, there must be considered the environment, the character and method of feeding, and the influence of disease.

Food Situation.

The under-developed and under-nourished condition of the great masses of the Filipino people is due to a number of causes, the principal one being insufficient quantity and injudicious variety of foodstuffs employed. The cause of the enormous influence of the faulty nutrition of the mothers upon infant mortality, directly and indirectly, is one of the most important subjects within the scope of any investigation of this character.

The mortality in breast-fed children is higher than it is among children artificially fed. This condition, so far as we know, is peculiar to the Philippine Islands. The logical, and we believe the correct, explanation of this is the deficiency in quantity and quality of mothers' milk. So far as ordinary analysis shows the breast milk of Filipino mothers is of satisfactory quality for nutritional purposes. However, certain diseases (particularly infantile beriberi) are generally believed to be caused by some abnormality of mothers' milk. In a considerable number of cases studied from the clinics of the Philippine General Hospital, deficient quantity has been a rather constant finding. When these facts are considered, together with the under-nourished condition of the majority of the mothers due to the ravages of disease, we must conclude that faulty nutrition of the mothers is one of the principal factors in the enormous mortality of breast-fed children. The correction of this condition resolves itself into a discussion of methods for the improvement of the quantity and quality of mothers' milk and of the artificial feeding of babies.

* From the *Philippine Journal of Science*, December, 1913.

In individual cases and to meet the immediate demands, satisfactory artificial feeding offers the obvious solution of the question. However, such a policy applied to the whole country would, eventually, lead to conditions more unwholesome than are those of the present time, and the ultimate solution of the problem, therefore, must depend upon improvement in the nutrition of the race. There are not in history more pathetic examples of unavailing self-sacrifice than are daily seen in our large clinics, of poor, half-starved, under-nourished mothers attempting to supply from their breasts food for one or more children, when their own metabolisms are in a starved condition. When asked the direct question as to the supply of food-stuffs, these mothers almost invariably state that they have plenty to eat, and the pathetic part of the story is that they believe that they are stating facts. These abnormal premises are the result of a peculiar unexplainable psychology that is of very wide application in this country, that the administration of food is more to satisfy hunger than to produce flesh and blood, and that the cheapest way in which hunger may be satisfied produces a satisfactory form of existence. It has been stated repeatedly that Filipinos do not care for foods other than fish and rice, with a few condiments and vegetables, but investigation tends to show that this is not a fact, and that these people have the same appetites and desire for fat and heat-producing foods as have people of other countries.

Infant Feeding.

Good milk is the only satisfactory food during infancy. Mothers' milk, under normal conditions, is the ideal food, and next, because of its physiological adaptability and because it is the only class of milk it is possible to produce in quantities sufficient to meet the world's needs, is cows' milk. With the conditions discussed above, showing the causes for deficiency in the quantity of mothers' milk, together with the well-known fact that fresh, clean, raw cows' milk is not obtainable in large quantities in the Philippine Islands, and that the prospect for a sufficient local production seems very remote, there is shown a new problem in infant feeding.

In considering the physiological requirements for the production of satisfactory baby food, it must be remembered that milk is just as essential an article of diet for the nursing mother in cases of breast feeding as it is for the baby in cases of artificial feeding, and recommendations for the solution of our local problem must bear this point in mind. The milk production of the Philippine Islands is practically *nil* when considered in relation to the requirements of the country. The principal supply consists of carabaos' milk and goats' milk, with a few dairies located in the larger cities, making a business of supplying cows' milk. We have gone rather carefully into the question of the quality of these milks, it being impossible in the time allowed to do anything regarding the correct estimation of the quantity produced. Nor is this necessary, because investigation of the quality leads to but one conclusion, and that is *that practically all fresh milk produced in this country is dangerous to health, in whatever manner used, and the marketing of these products should be interdicted by law.* Carabaos' milk and goats' milk, when obtained from healthy, clean animals, properly fed, and under proper sanitary surroundings, are excellent milks, but the requisite conditions do not obtain in the Philippine Islands, and with possibly one or two exceptions the conditions regarding the local supply of cows' milk are equally unsatisfactory. Nor is this all, for by no method of reasoning can we foresee a time when it will be practicable to produce satisfactory surroundings consistent with an ample supply of fresh milk *at a reasonable price.* The present custom of collecting, transporting, and using the local milk supply is unbelievably filthy, insanitary, and consequently dangerous, and a continuance of the present practice with the facts before us should fix criminal responsibility for the loss of life.

The milk sold on the streets of Manila—and presumably in other cities as well—is from twenty-six to thirty hours old; has been diluted with tap-water, or worse; has been collected and transported in dirty receptacles; has been milked by unclean persons from unclean animals; and both chemical and bacteriological examination, of course, shows this milk to be just about as bad as it is possible to make it. We have not seen a single sample that would even approach the margin of safety for its use by human beings, and in many instances evidences of sewage contamination and the presence of extremely dangerous bacteria are found in samples of milk bought in the open market. The same is true, to a less degree, of so-called fresh cows' milk sold in Manila. Under special conditions, which are obtained only at the expense of a very high cost of production, surroundings have been produced by which clean milk could be marketed. Notable in this respect is the very excellent work at La Gota de Leche, which by careful supervision of model dairies has been able to produce good milk; but even under these circumstances, which raise the cost of milk to 50 centavos* a litre, the distinguished officials controlling the policy of this institution have felt it necessary to sterilize the milk before allowing its consumption by the babies under their care. If sterilization still is necessary after the precautions and expenses incident to the production of milk by La Gota de Leche, the problem of furnishing raw, fresh milk in quantities sufficient to influence infant mortality in this archipelago would appear to be one surrounded by impassable difficulties.

Taking all the evidence into consideration, a raw, fresh milk supply, sufficient to meet the absolute requirements of the country, does not seem to be within the bounds of possibility—at least within a reasonable length of time. All authorities acknow-

* One centavo equals $0·005, United States currency.

ledge that raw milk contains elements of nutritional value not found in any sterilized milk, and so far as we are informed the only differences to be found between sterilized milks are differences in chemical composition. Therefore, in all probability, sterilized milk of local production has no advantage over imported sterilized milk. The question, then, resolves itself purely into one of financial consideration. Other things being equal, the cheapest milk should be the one adopted for our general use.

Pasteurization.

So much has been written recently regarding the methods of Pasteurization of milk in tropical countries that a very brief consideration of this subject seems pertinent. Formerly, Pasteurization was considered an efficient method of preparing milk for human consumption, because of the destruction by this method of dangerous disease-producing bacteria. We now know that the so-called pathogenic organisms are not the only, even if they are the most dangerous, bacteria in milk. Pasteurization, of course, does not destroy spore-bearing bacteria, and, therefore, any milk not kept below a temperature of from 20° to 22° C. after Pasteurization acts as a culture medium for those germs not destroyed by the low degree of heat used in the method of Pasteurization. Intrinsically, most of the bacteria of this class are not considered pathogenic, but as a result of their multiplication the chemical composition of the milk is altered, and as by-products of this alteration there are produced dangerous chemical poisons which are very important factors in the morbidity results produced by the ingestion of milk. Conditions for the growth of bacteria in the Philippine Islands are ideal, and with a very limited ice supply and without much prospect of improving this condition the after-care of either fresh or Pasteurized milk becomes impossible for the vast majority of people. Actual experimentation has shown that the multiplication of bacteria in Pasteurized milk is so rapid that within a few hours after Pasteurization such milk is almost as dangerous as if this process had not been employed.

We come, then, to completely sterilized milk as being the only variety of this life-giving food practicable of extensive employment in this country, at least at the present time.

Fortunately, conditions are not so bad as they would appear at first sight. Sterilized milk when used under proper conditions is a very satisfactory food for infants, and is just as satisfactory for all other purposes as is raw milk; and another fortunate circumstance is that the Philippine Islands enjoy a splendid market of imported sterilized, natural, and condensed milks of excellent quality at very reasonable prices, so that the milk supply of the Philippine Islands compares very favourably with that of many other countries and cities. It is a fact that sterilized milks are a little more indigestible than are raw milks, and there are certain metabolism conditions, for example, scurvy, that may be incurred as a result of the use of sterilized food. However, both the indigestibility and the metabolism-disturbing qualities of such milk are easily and satisfactorily controlled by simple methods well known to the medical profession. These methods are so successful that in one series of records of more than 1,000 babies born in the Philippine Islands, and fed entirely on these sterilized foods, there has not been a single case of metabolism disturbance nor a death from disease of importance that could be justly attributed to the use of such food.

It may be of interest to note that there was imported into the Philippine Islands during the fiscal year 1912 an equivalent of between 18 and 20 million kilogrammes of milk, at an approximate valuation of 7,500,000 dollars.

Methods of Artificial Feeding.

The methods employed in the artificial feeding of infants among the poor people of Manila are faulty in many particulars. In the first place, notwithstanding the accessibility of a very good milk supply, the foods supplied to children in a majority of cases are those of condensed, sweetened, skimmed milk of the cheapest varieties, and consequently poor in quality. The apparent economy in the use of this food, figured from a financial basis alone, is not a true economy, because milk compounds of this class contain from 50 to 65 per cent. of ordinary sugar. When the caloric value of the actual milk contained in these tins is figured at the current prices, and this price subtracted from the total price of a tin of one of these mixtures, it is found that the people pay an average of from 50 to 75 centavos a kilogramme for ordinary sugar, which they can buy in a shop for 11 centavos a kilogram.

It is, of course, unnecessary to dwell upon the undesirability of the use of this class of foods, and it only remains to point out that it is bad in principle, and what apparently, heretofore, has not been recognized, that it is a more expensive method of feeding than would be necessary by the employment of good qualities of milk.

It should be stated that there is one favourable feature in the use of sugar-preserved milk compounds, and that is that the excessive amount of sugar preserves the food from the time of the opening of the tin until the food is entirely consumed. This is, of course, an important problem with poor people who cannot afford the ice necessary for the preservation of any pure milk, whether sterilized or not, after the tin is opened. However, this should not be a serious obstacle in the adoption of the use of a better grade of milk, because the method that is used to a greater or less extent among the poorer people of the United States, in which a number of neighbours who have nursing children alternate in the opening of the tins of food, so that each tin when opened is consumed by a number of babies in a few hours, might well be adopted here. Another solution of this problem that already is being employed by some manufacturers consists in marketing milk in much smaller tins.

The next most important faulty custom consists in the dilution of milk compounds with unsafe

water. In our investigation of the causes of death of 300 babies, it is found that tap-water, either with or without boiling, is used as a diluent in most instances. As a majority of the houses of these people are at considerable distances from the nearest faucet, the water is carted by water carriers and kept in earthenware jars or other vessels, under the most unsanitary conditions; in many instances whatever safety might be secured by boiling the water is destroyed by the subsequent manipulations and care of the water and by the methods employed in making the dilutions of the milk mixtures. The proof that these mixtures are dangerous to the health of the baby, on account of the introduction of bacteria, is shown by the analyses of the contents of a number of nursing bottles already prepared for consumption by the baby. These analyses of the finished product of food just before administration show dangerous contamination in practically every instance, and this has been found particularly true in cases of children dying from gastro-intestinal disturbances.

Other faulty methods which need not be discussed at length here are the almost universal custom of feeding babies with the greatest irregularity in time, quantity, and strength of food administered.

The remedy for these conditions, obviously, is education, both by theoretical instruction and, best of all, by practical demonstration as may be seen in the wards and clinics of the hospitals and La Gota de Leche, and, as has been recommended by the Committee for the Investigation of Infant Mortality, by the establishment of nursery maids, training schools and day nurseries.

The remedy controlling the character and quality of foodstuffs employed, however, lies in the hands of the legislative body, and the question should be treated by discriminating high import duty on unsatisfactory milk compounds and by allowing free entry to the better qualities.

In order to solve the infant mortality question in this or any other country, the first essential is to secure the influence of a favourable and interested public opinion.

The attitude of public opinion in health matters is a very popular one, and even in older countries with more advanced civilization it is only within recent years that conservation of health has been of much interest to the general public.

Public opinion is vitally active regarding the pecuniary interests of the country, as exemplified in commercial activities and improvements, and even in the health and protection of draft animals and in the comfort and well-being and protection from cruelty to domestic animals.

However, with regard to the great vital question of the conservation of the health of its citizens and the saving and protection of the lives of infants, there exists a curious indifference that only springs, periodically, into activity as the result of some spectacular catastrophe, and dies down again with the restoration of the usual equilibrium.

The great Taal volcano eruption destroyed some two thousand lives and a great deal of property, and its results sent waves of horror throughout the world. There are more lives uselessly sacrificed to tuberculosis in the Philippine Islands every month than were destroyed by the Taal eruption; and the economic loss to the country by decrease in potential energy and earning capacity of its citizens, to say nothing of the actual loss of life, costs the country daily many times the value of property destroyed by Taal.

The recent catastrophe in Cebu and other southern islands sent a wave of horror over the country and called out Government and private reserves to meet the requirements of the situation. The loss of life and health is greater from criminal obstetrical practices in the Philippine Islands every day of the year than was the loss of life at Cebu. The financial drain upon the resources of the country as a result of these preventible and criminal practices is a greater daily drain than the total value of the property destroyed by this unavoidable calamity.

In older and more experienced countries there is at last an awakened public opinion regarding the economic consideration of health problems, and one of the most important questions for us is to secure the support of this valuable weapon in our campaign for the conservation of the lives of the potential citizens of this country.

SOME EXPERIMENTS ON THE INOCULATION OF MONKEYS WITH SMALL-POX.*

By P. M. Ashburn, E. B. Vedder, and E. R. Gentry.

(1) Experiments with Vesicle Contents from a Case of Discrete Small-pox.

On December 4 the case of a Dutch traveller who had contracted small-pox in China came under observation. This case was a very typical discrete small-pox in a man whose general condition was excellent and who had been successfully vaccinated in childhood (about 1884) and revaccinated with doubtful result about 1900. At the time of admission he was moderately covered with discrete lesions, those on the upper part of the body being good vesicles, those on the feet and legs not quite mature. He was in the eighth day of the disease. Vesicle contents drawn into capillary tubes was used to inoculate five monkeys. Other vesicle contents in capillary tubes was preserved for later use.

Experiment with Monkey No. 5.—A large male, that had been successfully vaccinated in October, was inoculated at six sites on the abdomen on December 4 with fresh vesicle contents. No local lesions resulted. There was, however, a moderate rise of temperature on the third day, followed by a drop, and a second rise on the sixth day, with almost continuous elevation to the seventeenth day. We call attention to the probability of this rise being due to variola sine eruptione, the eruption being

* From the *Philippine Journal of Science*, December, 1913.

absent because of the protection afforded by the vaccination in October.

Summarizing the experiments with fresh vesicle contents, we may say that inoculation with it, by way of scarifications of the skin: (1) caused variola inoculata in two unvaccinated monkeys, the primary lesions, secondary lesions, and temperature curves being alike in the two instances and probably characteristic; (2) caused in a vaccinated monkey (No. 5) a fever very similar to that produced in variola inoculata, but gave rise to neither primary nor secondary skin lesions. This fever might well be the manifestation of variola sine eruptione. Placed free on the mucous membranes of the conjunctivæ, nares, and mouth, the virus caused no disturbance, or, if any, so little as to be insufficient for interpretation as an evidence of infection.

Of the fresh vesicle contents tubed and not used on the above monkeys, the greater part, probably twenty tubes, was used for the inoculation, by scarifications and intravenously, of two horses. Neither animal showed symptoms or signs that could be interpreted as small-pox. The remainder, which was partly clear vesicle contents and partly contents drawn on December 7 and showing slight turbidity, was kept in an ordinary ice-chest for twenty-four days and was then used to inoculate two monkeys.

Monkey 23.—A large unvaccinated male monkey was inoculated December 31 at several points on the abdomen with 24-day-old vesicle contents. On January 6 five points and lines of induration, swelling, and slight redness were noted about inserts, and the temperature was elevated.

By the 8th the induration, redness, and swelling were all beginning to diminish. Dry scabs covered the points of insertion. No secondary lesions developed. On January 7 some of these scabs were raised and the beds on which they rested scraped. These scrapings and the triturated scabs were used to inoculate monkeys 8 and 16.

Summarizing these experiments we may say that vesicle contents, capable when fresh of causing variola inoculata in monkeys, so loses its virulence by being kept for twenty-four days in the ice-chest as to be no longer capable of producing the typical disease with prolonged fever and primary and secondary lesions. It did produce an ephemeral rise in temperature in both instances after an incubation period prolonged beyond the ordinary length, and in one of the two instances it gave rise to abortive and atypical primary lesions. In neither instance did secondary lesions or severe disturbance result.

The above finding would indicate that a working and satisfactory small-pox prophylactic might be secured by storage and attenuation of virulent vesicle contents, but prophylaxis by vaccination as practised is so safe, satisfactory, and efficient that the pursuit of the clue appears at present unnecessary.

(2) Experiments with Scabs or "Discs" from the above Case of Small-pox in Man.

As the lesions on the person of the Dutch traveller matured and the scabs fell or were picked off, they were all collected and saved; one-half of them were placed in glycerine and one-half were placed dry in a sterile test-tube.

On December 19, the patient's sixteenth day in the hospital and about the twenty-third day of his sickness, some of each lot of scabs were triturated in saline solution and some with the serum of a vaccinated monkey, so as to make thick suspensions. With these suspensions monkeys 28, 22, 26, 27, and 29 were inoculated, five or six insertions being made on the belly of each.

Monkey 28.—This monkey received scabs preserved in glycerine and triturated with vaccinated monkey's serum. No local lesions developed. On the eighth and tenth days the monkey showed sharp rises of temperature. He thereafter appeared well.

The sites of inoculation were first reddened on December 8; on the 10th the redness and induration were very marked, as in monkey 19. On the 11th small vesicles or pustules marked the insertions, and two of them were ruptured. The next day the swelling and redness had begun to subside and the lesions were scabbed. On the 13th small secondary lesions, papules, were seen on the legs and about the anus. On December 15 a profuse eruption of small vesicles and pustules, more numerous than in monkey 19, was present on the palms, arms, legs, face, and scalp. The abdominal lesions were subsiding, and the inflammatory process in the abdominal wall was almost gone. On the 17th the belly wall was more inflamed and indurated and the swollen ridges were black on top; apparently secondary infection had occurred. All the secondary lesions were either pustules or scabs. On December 18 the tops of the swollen ridges on the belly sloughed, leaving extensive ulcers, and it may here be stated that these ulcers were not completely healed until the end of the month. Numerous pustules of the secondary lesions were yet unscabbed, but by December 21 all had become so, and desquamation was completed by the 26th, the completion being delayed on the palms, where the discs were held down by thickened epidermis, and on the legs, where entanglement of hairs in the scabs doubtless delayed it.

This case we also regard as one of variola inoculata in the monkey, characterized by fever and signs of local inflammation on the fifth day; by primary and secondary eruptions, the latter appearing on, or escaping notice until, the tenth day; and continued fever until the fifteenth and possibly the nineteenth day.

Monkey 12.—A medium-sized unvaccinated monkey was given a drop of fresh vesicle contents in each eye, each nostril, and each side of the mouth on the morning of December 5. The virus was placed free on the mucous surfaces. No local lesions resulted, and no systemic disturbance other than a trifling rise of temperature on the sixth, seventh, and eighth days, and we are unable to affirm that any infection occurred.

On January 16 he was again found to be sick and to have a high temperature, and on January 19 he died. Autopsy showed streptococcus septicæmia as

the cause of death. That the sharp rises in temperature on December 26 and 28 were related to the septicæmia that caused death three weeks later, notwithstanding the interval of apparent health and normal temperature, is possible.

Four monkeys inoculated with dry scabs triturated in 0·85 per cent. saline solution; these monkeys showed no reaction, either local or general.

On December 24 two monkeys were inoculated at six points on the belly with dried scabs, and one monkey with both dry and glycerinated scabs. None of them showed general or local disturbance.

(3) Experiments with Scabs from a Case of Recovered Varioloid on the Sixteenth Day.

In addition to the case of small-pox above mentioned, the United States Army transport *Sherman* arrived in port on December 1, 1912, with a naval recruit in his sixteenth day of modified small-pox, which he had contracted in San Francisco and developed after leaving Honolulu. The attack had been mild, the lesions abortive, and at the time of his arrival here the man showed only a few small, dry, brown scabs. These were all collected, and on December 2 were triturated in sterile 0·8 per cent. salt solution and used to inoculate three monkeys, Nos. 6, 17, and 18.

Monkey 6.—This animal had been successfully vaccinated in October. No lesions followed inoculation with the scabs. The animal had an irregular temperature from the first and was sickly. On December 18 it was killed, in order to get vaccine immune serum.

Monkey 17.—A medium-sized female, unvaccinated, showed no disturbance and no lesions as a result of the inoculation.

Monkey 18.—A small unvaccinated male showed neither lesions nor systemic disturbance as a result of the inoculation. He was later (December 24) successfully vaccinated.

(4) Experiments with Scabs from Variolous Monkeys.

While two monkeys were suffering from their variola attempts were made to obtain vesicle contents from them, but the vesicles were so small and so soon ruptured by the animals that it was found impracticable. Scabs were collected, however, as the lesions dried, and these were used to inoculate monkeys 24, 25, 30, and 31. The results in all of these animals were quite negative, with the exception of monkey 24.

Monkey 24.—A medium-sized female was inoculated, December 19, with scabs from monkeys. No general or febrile disturbance resulted, but on December 26 there was swelling, redness, and marked induration of three points of insertion and their surroundings. The lesions formed dry scabs. The induration persisted about ten days, and the monkey remained well.

Whether or not the above monkey suffered from modified primary lesions of small-pox we cannot know positively, but it seems probable. At any rate, all of the above experiments with small-pox scabs or discs from man and monkeys indicate that such material has but feeble virulence and that such as it has is speedily lost.

On January 7, 1913, the scabs were lifted from the lesions on monkey 23 (see above), the underlying tissue curetted, and the pulp so obtained used to inoculate monkeys 8 and 16.

Monkey 8.—A monkey that had been vaccinated in October with the vaccine scab from a pig, atypical but supposedly successful "takes" having been obtained, showed redness and slight swelling at the points of inoculation with pulp from No. 23, but nothing at all characteristic or strongly suggestive of small-pox or vaccinia.

Monkey 16.—This monkey had been unsuccessfully inoculated in November with vaccine triturated in 1 per cent. phenol in 0·85 per cent. saline solution and so kept for two weeks, no "take" resulting. Inoculated with "pulp" from the lesions of monkey 23 on January 7, the animal had a rise of temperature beginning the sixth day.

Beginning on the seventh day after inoculation, the animal showed marked induration and some œdema of and about the sites of inoculation and thick dry scabs formed. The induration was deep. On January 16 (tenth day after inoculation) the scabs were lifted, the areas beneath curetted, and the pulp so obtained used to inoculate monkeys 25, 19, 28, and 3, the first three of which have been discussed, and the last being a monkey vaccinated in October. None of them showed general or local disturbance.

This experiment indicates that the virus in vesicle contents, although attenuated by storage and further attenuated by passage, was still recognizably active in this animal, but not sufficiently so to survive another passage.

Summary.

(1) Fresh vesicle contents from a case of human variola is capable, when inoculated into abrasions or scarifications on non-vaccinated monkeys, of producing variola inoculata in those monkeys, the disease being marked by fever and by primary and secondary lesions.

(2) Such vesicle contents kept at ice-chest temperature for twenty-three days loses most of its virulence, but may still, in a proportion of instances, produce a mild and atypical variola inoculata, which in turn and in further modified form may be passed to other monkeys.

(3) Active and fresh vesicle contents inoculated on vaccinated monkeys may produce a fever closely resembling that of variola inoculata in the monkey and a condition permitting of interpretation as variola sine exanthemate in the monkey.

(4) Small-pox scabs or discs from man or monkey possess but a low degree of virulence, or very quickly lose their virulence.

(5) When inoculation of such scabs does result in the production of infection this may be manifested only locally at the site of inoculation (Case 24). In

other words, the " B " part of small-pox virus survives longest in scabs.

COMMENT.

We admit that this small series of experiments affords but little proof of the correctness of our hypothesis as to the relationship of variola and vaccinia. On the contrary, we do not see that it affords any evidence in disproof. The case of monkey 5, although of little value standing alone, is certainly susceptible of being cited as an instance of variola sine exanthemate, as an instance of separation of the elements of small-pox virus (the pock-producing or " B " part having acted on the monkey in October; the toxæmia-producing, pyrogenic, or " A " element in December), and as proof that vaccination protects against the pock-forming element of small-pox rather, or to a greater degree, than against the whole disease. We feel justified in restating our hypothesis that small-pox is due to a dual and divisible virus, one part of which is the cause of vaccinia and the pock stage of small-pox, the other part being necessary for the production of the highly contagious, febrile, general disease with an initial stage and preliminary rashes.

HYDATID CYST OF THE LIVER.*

By Dr. J. CASAUX.

Case 1.—A woman, aged 36, with a six years' history of digestive disturbance and inability to take fatty foods, with a feeling of weight in the region of the liver where later swelling was noticed.

The tumour gradually became larger; there was no epistaxis nor urticaria, but persistent pruritus, especially at night. The patient was very thin and emaciated.

There was marked swelling in the right hypochondrium. The thorax was distended, the ribs raised and the last intercostal spaces approximated. The tumour extended five fingers' breadth below the costal margin and transversely as far as the mid-line. It felt soft, distinctly fluctuating, without bosses. There was no vibration or tremor, there was no local œdema, no sensation of friction, no pain. The dulness extended upwards to the fourth rib, below this limit back and front the chest was dull. There was no vesicular murmur except at the upper part of the lung. In the base behind there were light superficial frictions. Breathing was embarrassed.

A 4-in. incision was made in the most prominent part of the tumour parallel to and 1 in. below the costal margin. Upon opening the peritoneal cavity the tumour was seen of a brownish colour, very tense to digital examination. A trocar was introduced, when a rupture occurred and some fluid went into the peritoneal cavity. The lips of the tear were seized in forceps, the interior of the cyst was scraped with the finger to remove the gelatinous debris and large flakes of viscid membrane. It was then dried with mops, the cavity being very extensive in all directions. The cyst was stitched to the lips of the incision and the cavity washed with 1 per cent. formalin. The contents were at first clear, then green and thick; when collected they amounted to 12 litres. After the operation the pulse was very weak (108) and caffein and camphorated oil were injected. There was vomiting, distension of the abdomen, which was painful to pressure. Notwithstanding injections of serum and collargol the patient became continually worse and died on the fifth day.

At the *post-mortem* there was no peritonitis and no fluid in the peritoneum.

Case 2.—A man, aged 43, with a three years' history of digestive disturbance and loss of appetite, and a distaste for fatty foods, and with so rapid a debility that at the end of a few months the appetite was extremely bad, with nausea and vomiting. From time to time he had jaundice. For two years a swelling of the right hypochrondrium was noticed and heavy pain in the back, especially in the right shoulder. Inspection showed an oblong swelling most prominent above and to the right of the umbilicus; the costal margin was unaffected. The swelling followed the respiratory movements.

Except for jaundice the skin was normal. The tumour was felt to extend horizontally a little above the level of the umbilicus, and mesially it extended behind the external edge of the rectus. It descended with inspiration. There was no local œdema. Dulness was continuous with the liver which extended to the sixth rib; there was no vibration or tremor. The stools were of a high colour, constipation had alternated with diarrhœa.

A transverse incision was made 1 in. below the costal rib, the swelling was punctured, emptied and injected with formalin solution. The fluid which came away was perfectly clear. After suture of the lips of the cavity to the parietal incision the interior of the cyst was wiped and a white transparent membrane extracted. The patient remained in a poor condition, but insisted upon leaving a month after operation, although the wound still required irrigation and dressing. He died somewhat later.

* From the *Bulletin de la Société Médico-Chirurgicale de l'Indo-Chine*, April, 1914.

SUPPURATING HYDATID CYST.*

By JACKSON CLARKE.

THE patient, a woman, aged 44, had a four years' history of dull, continuous, aching pain in the epigastrium and right hypochondrium, which was not in any way related to the absorption of food. She had occasional attacks of vomiting lasting weeks at a time. She had lost flesh for eighteen months and had had jaundice for fourteen days. On admission she was emaciated and cachectic and markedly jaundiced. There was tenderness over the liver and epigastrium; the lower border of the viscus was palpable ½ in. below the costal margin in the vertical

* From the *Medical Press*, May 13, 1911.

nipple line; the edge of the liver was very hard. The gall-bladder was enlarged and distended Temperature 103° F., pulse 128. The patient had previously been twice operated on. On the present occasion a bullet probe was passed up the existing sinus, which was about 5 in. in length; its orifice was near the mid-line of the abdomen. The walls of the sinus were felt to be remarkably indurated. Some 2 in. of the right eighth rib were resected between the anterior and posterior axillary lines. The point of the probe, which had been left *in situ*, was now felt under the area of the resected rib, where it was exposed. A rubber drainage tube was inserted into the new opening and passed along the sinus to within 1 in. of the opening of the sinus on the anterior abdominal wall. No drain was left in the anterior wall of the abdomen. Daily irrigation with iodine solution (a drachm to a pint of water) was carried out, but great difficulty was experienced in keeping up free drainage. The patient was discharged to a convalescent home with the tube still in, but complete recovery ultimately took place, and was attributable largely to the persevering drainage and irrigation.

Translation.

DISINFECTION AS PRACTISED AT THE PRESENT TIME BY THE USE OF STEAM AND FORMOL APPARATUS, AND DISINFECTION BY MEANS OF "CLAYTON" MACHINES.

How to prevent the spread of disease has been, in all ages, one of the most serious problems. From the earliest times disinfection has been strongly recommended, and one of the favourite methods was sulphur fumes, produced by the combustion of sulphur in pots. Investigations and experiments carried out under scientific supervision, possible only since the marvellous discoveries of that great benefactor of humanity, Pasteur, have recently shown that the means selected empirically by the ancients are, in effect, the best available at the present time.

In all civilized countries disinfection is now obligatory. It is a delicate operation, complicated as now used, and the application is attended with numerous difficulties. The great majority of the public accept it readily only in case of epidemics; consequently, the measures employed too often meet with opposition more or less open. Even those who recognize the necessity of it submit with a bad grace, and complain, not without reason, of the inconvenience caused, the length of the operations, and the damage done to their personal effects, inevitable with the methods actually employed. The sanitary staff is not supported by the very people who would benefit most by its efforts, and one cannot be surprised if the impatience of the public affects the staff and injures the quality of its work.

This impatience, however, is quite comprehensible. A bereaved family, mourning the loss of one of its members, sees people arrive who demand the bedding, linen, effects and articles of all sorts used by the dear lost one, as well as of everything that may have been contaminated during the illness (and very often this represents nearly all the family effects). All are carried away to be dealt with at a disinfecting station, and after a more or less long delay the articles of all kinds are returned mixed together, damp and partially deteriorated. The Assistance Publique of Paris have every year very large sums to pay for damage caused to articles disinfected at these stations, but these payments are far from representing the total loss. In many cases the poor people have to put off going to bed until their only mattress is brought back, which is too often returned to them in a very wet condition when the disinfection has not been followed by efficient drying. It is useless to dwell upon the results.

While these articles are being thus disinfected the dwelling-place is handed over to a gang who wash the furniture with a solution of sublimate, or perhaps introduce steam and formol or some of its derivatives. After both processes everything remains in a damp, comfortless condition, and the disinfectant in addition leaves an extremely disagreeable smell, which lasts for days, in spite of ventilation.

One can conceive the real sufferings involved in a present-day official disinfection, and one can quite understand the opposition incurred to the declaration of a disease after which such a method of disinfection is imposed.

Of course, a thorough disinfection cannot be carried out without inconvenience, but this should be reduced to the strictest minimum.

To be efficacious, a disinfection should be carried out promptly, and in such a manner as to avoid the risk of spreading the disease; it should reach all pathogenic microbes, not only those found on clothes, linen, &c., or in the bedding, but also those which may have settled on furniture or in carpets, on the floors and walls of the dwelling; it ought also to destroy all insects whose *rôle* of propagators of disease is universally acknowledged.

At present, as we have seen, several different operations are carried out which only give incomplete results, for no single one of the methods actually employed suffices in itself. One process, applied on the spot without handling the articles, destroys microbes directly exposed, but does not reach those in any way protected, and does not affect the insects. Another, which reaches the microbes whether exposed or protected, necessitates handling the articles, bedding, &c., and removing them from the contaminated place. There are certain articles in common use capable of transmitting infection which cannot be exposed to either one or the other process.

If it were possible to abolish the removal of clothing, &c., and their disinfecting at a station, the risk of spreading the infection would be avoided, the articles would not be damaged, and the families would be spared the grief of having to assist at such measures, which cannot fail to shock feelings entitled to every respect. If it were possible, by a single operation, to disinfect the infected premises with all the contents, our means of defence against disease would be strengthened, the

inconveniences diminished and, consequently, the opposition of the public lessened.

Is it possible to attain this result? The "Clayton" system is the only method we know of at the present day that accomplishes this end.

For the destruction of all kinds of vermin this system has been employed for years throughout the whole world, and in this respect its superiority is incontested and incontestable. Modifications and improvements recently added to the machines, and to the manner of using them, now allow of the same excellent results being obtained in disinfection as in deratization and destruction of insects.

The annexed table furnishes the proof. It shows the results of a disinfection carried out at the Hôpital de la Pitié at Paris, under the supervision of a Commission of the Conseil Supérieur d'Hygiène Publique de France.

The possibility of destroying pathogenic microbes by the "Clayton" process once established, its superiority over others becomes evident.

The "Clayton" apparatus suffices in itself. Not only does it fulfil the *rôle* of the disinfecting station, but it renders unnecessary all additional operations.

The complete disinfection of the premises and of all the contents is carried out in a single operation, which at the same time destroys all the insects and their eggs.

There is no danger of spreading the disease; the centre of infection is reached on the spot.

All articles remain in their respective places. No handling is necessary, the gas penetrates everywhere, therefore it is not necessary to unfold garments, to open parcels of soiled linen, beds, cupboards, &c., nor to disturb carpets, curtains, furniture. Furs, articles in leather and skin (shoes, gloves), india-rubber, silk, velvet, &c., as well as furniture, are not damaged by the action of the gas. Needless to say, many of these articles would be absolutely ruined if treated at the ordinary disinfecting station.

"Clayton" gas is dry, and is introduced into the premises to be treated at the temperature of the air, consequently there is neither humidity nor condensation, and the smell quickly disappears after aeration carried out by means of the machine itself.

The gas diffusing itself under the action of a powerful blower, the machines can be used to disinfect at a single operation the most extensive premises, whilst by the usual method it is possible to treat only a certain number of articles limited by the dimensions of the apparatus, the capacity of which is always restricted. There are several types of these machines, all equally efficient, but of different capacity, from the smallest which weighs only about 3 cwt., and is suitable for the disinfection of small places of about 500 to 700 cubic feet, to the largest which weighs 5 tons, delivers about 750 cubic feet of gas per minute, and is capable of disinfecting the largest ships.

The motive force employed to operate the blowers may be either steam, electricity, petrol, or oil; the motor varies from ½ h.p. to 15 h.p., according to the type of machine.

The only material necessary to produce "Clayton" gas is roll sulphur, which has been employed, as we have seen, from the earliest times; it is cheap, can be obtained everywhere, and lasts indefinitely. Consequently, the operations are simple and inexpensive.

Clayton system officially authorized for disinfection by the Conseil Supérieur de Santé de France after the following results obtained at a disinfection of an amphitheatre of the old "Pitié" Hospital, Paris, situated in the Michou building, and having a cubic capacity of about 425 cubic metres, by a Clayton machine type "H."

Diphtheria ...	on floor ... / at 0·80 m. / at 0·50 m. / near ceiling / at 1·20 m.	closed envelope	All destroyed.
Typhoid bacillus	on floor ... / at 0·80 m. / near ceiling	closed envelope	All destroyed.
Coli bacillus ...	at 1·20 m. / at 0·50 m.	closed envelope	All destroyed.
	wrapped in cloth 1 thickness		
	,, ,, 2 thicknesses		
	,, ,, 3 ,,		
Staphylococcus	on floor ... / at 0·80 m. / at 1·20 m. / at 0·50 m. / near ceiling	closed envelope	All destroyed.
	wrapped in cloth 1 thickness		
	,, ,, 2 thicknesses		
	,, ,, 3 ,,		
Subtilis ...	at 0·80 m. / at 1·20 m. / at 0·50 m.	closed envelope	Development retarded 36 hours.
Anthrax ...	on floor ... / near ceiling	closed envelope	Development retarded 24 hours.
Tuberculosis ...	on floor ... / at 1·20 m. / at 0·50 m. / near ceiling	closed envelope	4 guinea-pigs show no trace of tuberculosis.

Diphtheria ...	Inside woollen mattress ... / ,, seaweed ,, ...	All destroyed.
Coli bacillus ...	Inside woollen mattress ... / ,, seaweed ,, ...	All destroyed.
Staphylococcus	Inside woollen mattress ... / ,, seaweed ,, ...	All destroyed.
Subtilis ...	Inside woollen mattress ..	Development retarded 36 hours.
Anthrax ...	Inside seaweed mattress ...	Development retarded 24 hours.
Tuberculosis ...	Inside woollen mattress ... / ,, seaweed ,, ...	2 guinea-pigs show signs of tuberculosis.

N.B.—Seeing that the subtilis and anthrax, exposed under different conditions, were both retarded for the same length of time, it is evident that something abnormal took place for two out of the six guinea-pigs to show signs of tuberculosis.

Every maritime station which possesses type "B," of these machines, for the destruction of vermin on board ship need only add others of smaller type, specially adapted for the disinfection of cabins, crews' quarters, &c., with all their contents, to avoid having to carry away belongings and bedding to the stoves, as is done at the present time, and while the holds are being disinfected with the "B" machine, the small spaces are treated by the others.

Every ship provided with a "Clayton" apparatus for the extinction of fire possesses at the same time the means of getting rid of all vermin and of disinfecting thoroughly in case of disease on board, and the maritime sanitary authorities grant special favours to vessels so equipped. Delay in quarantine is also reduced thereby, and in fact sometimes entirely avoided

Notes and News.

GERM TRANSFORMATION.

MME. VICTOR HENRI, working in Dr. Roux's laboratory, has, in a communication read before the Academy of Science in Paris, announced that under the influence of the ultra violet rays, a bacillus has been transformed into a coccus. The experiment was made with the anthrax bacillus, which after prolonged exposure to the rays developed into a microbe of quite a different character. This is an interesting step in the evolution of bacteriology, and what has been found to hold good *in vitro* may in time be found to be capable of being extended to changes in living tissues. We are getting accustomed to the idea that the apparent specific differences of germs are but stages in development, starting from some common source, and that soon the present-day divisions founded upon shapes, &c.—bacilli, cocci, flagellated bodies, comma bacilli, &c.—will become obsolete as a basis of classification.

LONDON SCHOOL OF CLINICAL MEDICINE.

COURSE ON SYPHILIS.

This course, referred to in our last issue, is arranged as follows :—

Monday.—10-11, Ear, Nose, and Throat Complications of Syphilis, Mr. Biggs; 11-1, Ward Work, including the taking of case notes, doing of dressings, injections, &c.; 2-4, Laboratory Investigations and the practising of Laboratory methods of diagnosis, Wassermann tests, Luetin tests, and the staining of Gonococci, &c.

Tuesday.—10-12, Ward Work; 12-1, Diseases of the Skin, including many due and analogous to Syphilis; 2-4, Laboratory Work, with tuition and supervision from Dr. Davies; 4.15, on alternate Tuesdays, Skin Diseases, Sir Malcolm Morris.

Wednesday.—10.30, the Eye Complications of Syphilis and Gonorrhœa; 11.30-1, the Cerebral, Spinal, and Nervous Complications, by Dr. Gordon Holmes or one of the other physicians; 3-4, Ward visit with Mr. C. C. Choyce, F.R.C.S.

Thursday.—10-12, Ward Work; 12-1, Dr. MacCormac, special lecture on Syphilis; 2-4, Laboratory Work.

Friday.—10.12, Ward Work; 12-1, Dr. MacCormac, Clinique for Skin Diseases; 2-4, Laboratory Work, under the tuition and supervision of Dr. Davies.

GLANDERS.

THE latest number of the *Monthly Bulletin* of the New York Health Department states that in the Borough of Manhattan in 1913 there were discovered 589 glandered animals among approximately 65,000 horses, or about nine out of every 1,000. The disease is found to be most frequently transmitted through blacksmith shops and public drinking troughs. In the city of New York there were in 1909 three deaths from human glanders; in 1910, four; in 1911, three; in 1912, five; and in 1913, one.

ARTIFICIAL MILK FROM THE SOY BEAN.

IT is reported from Bockenheim, Germany, that an artificial milk is being made from the soy bean—the well-known product of North China. So-called butter, cheese, and other alimentary products are being made and finding a ready sale in the area around Bockenheim. It is reported that the works already established can produce 11,000 gallons daily of artificial milk which, it is said contains 4 per cent. of fatty matter. There is no end to the degradation to which the modern chemist will drag down his profession; it is not mere substitution but a prostitution of chemistry that is going on at the present day in many departments of our food supplies.

THE SUGAR-BEET PARASITE.

Aphis enonymi, a species of green-fly, is the chief enemy of the sugar-beet in Europe. The life-history and development of this insect, which is the pest of several plants, is interesting.

Starting from the egg, the larvæ in a short time become wingless females, which soon produce viviparously (without an egg stage) another generation of unwinged as well as winged insects, some of which fly away to found fresh colonies on other plants. Towards autumn, egg-laying females are developed, who deposit their eggs in the axils of the buds and other parts of trees or shrubs. Males, some of whom are winged and some wingless, are also produced at this time, and are responsible for the fertility of the eggs. The wingless insects, popularly known as "plant lice," are by far the most numerous. They have a beak or sucking tube, with which they pierce the skin of the plant and suck up the juice. This is the cause of the crumpled condition of the leaves and other parts of the plant attacked.

Original Communications.

NOTE ON A CASE OF OSTEOPERIOSTITIS DEVELOPING AFTER A PROBABLE ATTACK OF "FEBRIS COLUMBENSIS."*

By ALDO CASTELLANI, M.D.
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IN 1905 I described and published a case of fever, somewhat resembling enteric, due to a germ which I called *Bacterium columbense*. Later, impressed by the peculiar, somewhat inconsistent, sugar reactions of the micro-organisms, I was inclined to consider the bacterium no longer a separate species and was inclined to identify it with the *Bacillus paratyphosus* B. Recently having had an opportunity of isolating the same germ from two further cases and studying it more completely, I have been forced to come to the conclusion I had arrived at eight years previously, viz., that the germ is a separate species and the fever caused by it a separate entity from either typhoid or paratyphoid. These two cases have already been published and recently I have studied three further cases. The complications and sequelæ of this fever are practically unknown; it may therefore be of some slight interest to relate a case recently observed of chronic osteoperiostitis, due to *B. columbense*, which from the history given by the patient and his relations must have developed in all probability after an attack of "febris columbensis." The patient, a Singhalese, was admitted to the general hospital in December, 1913, and placed in Dr. Marcel de Silva's surgical ward. He had several sinuses in the left arm discharging sero-purulent matter. According to the patient and his relations the condition had commenced with painful swellings more than a year previously, after an attack of continuous fever which had lasted six weeks. Dr. Marcel de Silva operated on December 12 and again on February 3, and several spicules of bone in the form of sequestra were removed. The surgeon suspected the condition to be due to previous typhoid and sent a sample of blood for Widal's reaction to the Bacteriological Institute. The reaction was negative. At the Bacteriological Institute all bloods sent for Widal's reaction are also tested for Malta fever, paratyphoid A, paratyphoid B, *B. columbensis*, *B. asiaticus*. We found out then that while the specimen of blood sent by the surgeon had no influence on typhoid, paratyphoid A, paratyphoid B, *Micrococcus melitensis* and *B. asiaticus*, it agglutinated *B. columbensis* well. With Dr. de Silva's kind permission a more complete bacteriological examination of the case was undertaken.

SERUM REACTIONS.

The blood examined on four different occasions has shown complete agglutination for *B. columbensis* in a dilution of 1 in 40 and occasional feeble agglutination in a dilution of 1 in 80. The blood agglutinates equally well the strain isolated from the first case of "febris columbensis" in 1905, the strains recently isolated in two cases in 1913, and the strain isolated from the pus of the lesions shown by the patient.

PRESENCE OF *B. columbensis* IN THE PUS.

The bacteriological examination of the pus by plating, &c., has revealed the presence of the typical *B. columbensis* as described by me in 1905. As this germ is yet little known, it may perhaps be of advantage to give here again its description.

	Motility	Litmus milk*	Lactose*	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrin	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Galactose	Lævulose	Inosite	Salicin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indole	Voges-Prosk.	Redn. nitrates	Neutral red	Gram	Gelatine	Serum	Broth	Peptone water
B. columbensis (Cast., 1905)	+	AVS / Alk	0 or AGVS	0	AG	AG	AG	AG	ASGS	0	AG	0	0	AG	AG	AG	0	AG	0	AG	0	AG	+	0	0	0	0	0	0	GTP	GTP VS

Abbreviations used in the table: A = acid, G = gas, C = clot, D = decolorized, Alk = alkaline, S = slight, A/Alk = acid then alkaline, GT = general turbidity, P = pellicle, VS = very slight, 0 = negative result, viz., neither acid nor clot in milk, neither acid nor gas in sugar media, non-production of indole, non-motile or non-liquefaction of gelatine or serum, as the case may be; + = positive result.

* See remarks in the text.

CHARACTERS OF *B. columbensis* (CAST., 1905).

Rods 2 to 5 μ in length closely resembling the typhoid and paratyphoid bacilli, motile. It is easily stained by the ordinary aniline dyes, but not by gram.

CULTURAL CHARACTERS.

Broth.—Abundant growth with diffuse turbidity: after twenty-four hours to forty-eight hours a delicate pellicle is generally present.

Agar.—The growth may be typhoid-like, but generally the germ grows more luxuriantly than is the case with typhoid.

Gelatine.—Growth fairly abundant, medium not liquefied.

Serum.—Nothing characteristic, the medium is not liquefied.

Litmus Milk.—It may be said that, in general, it becomes acid at first and alkaline later, and that bleaching of the medium is of very frequent occurrence, but occasionally the medium is rendered permanently acid. After three weeks, the medium,

* The author would be pleased to send a culture of the germ referred to in this paper to any worker interested in the subject.

if tubes are capped with rubber caps, may occasionally become thickened, or even real clotting, though of rare occurrence, may take place.

Sugar Broths and Action on Lactose.—The sugar reactions are collected in the following table. Some remarks may be made on the action of the germ on lactose: when the germ is freshly isolated from the stools or urine it has no action on lactose, but after several transplantations it may very slightly ferment this sugar at times, while it does not touch it at other times, using the usual technique with Durham tubes. The experiment has been repeated many times and all precautions have been taken to avoid mistakes as far as possible.

It is notable that on MacConkey's lactose red agar the colonies are always permanently white.

Biological Tests.—All strains of *B. columbensis* have been repeatedly tested with typhoid serum, paratyphoid A serum, paratyphoid B serum derived from patients suffering or convalescent from such diseases, as well as from hyper-immunized animals, always with absolutely negative results, the result being always negative, even using a dilution of 1 in 20. The strains have been tested also with very powerful paratyphoid A, paratyphoid B, sera obtained from the Berne Institute, with the same result, viz., no agglutination whatever is observed. The absorption tests completely confirmed the agglutination tests. There cannot be any doubt, therefore, that the germ is neither paratyphosus A nor paratyphosus B. The germ has been tested also with various coli and coli-like sera I have prepared, always with negative results.

Botanical Position of the Bacterium.

This bacterium is difficult to classify owing to its inconstant action on lactose. As already stated, though all precautions to avoid a mistake have been taken, the conclusion arrived at is that the same strain while at times it is a non-lactose fermenter, at other times it feebly ferments lactose with very slight production of gas. When it does not ferment lactose its reactions are practically identical to those of *B. paratyphosus* B; when it ferments lactose it is more closely related to *B. coli*. Agglutination and absorption tests clearly show that the germ is a separate species, as it is never agglutinated by paratyphoid A and B sera, even powerful ones, as those imported from the Berne Institute, nor from any coli and coli-like sera I have prepared. *Bacterium columbensis* cannot be identified with *B. paratyphosus* C of Uhlenhuth, as the latter is culturally identical to *B. suipestifer*, and in man at least is apparently not pathogenic.

It cannot, of course, be excluded that *B. columbensis* may be identical with one of the so-called paratyphosus D, &c., paracolon bacilli, &c., isolated by certain authors, as I have not in my hands the whole series of such germs to enable me to carry out comparative researches: even if such were the case, however, according to the rules of nomenclature the term *Bacillus columbensis* (Cast., 1905) would have to stand, owing to priority of description and name.

Conclusion.

In a case of chronic osteoperiostitis developing after an attack of continuous fever said to have lasted six weeks, a micro-organism has been isolated from the pus with all the characters of *B. columbensis* (Cast., 1905). The blood of the patient agglutinates the strain isolated from the pus as well as all the strains of *B. columbensis* kept in the laboratory, including the original one isolated in 1905.

There can be little doubt in my opinion that this germ has been the cause of the osteoperiostitis, and that the fever from which the patient states he suffered before the periostitis developed, was, according to all probabilities, an attack of "febris columbensis."

I wish to express my indebtedness to Dr. M. de Silva, 2nd Surgeon, General Hospital, for allowing me to investigate the case, and to Dr. E. C. Spaar for assistance rendered.

Malaria in Infants (W. Weston, *Archives of Pediatrics*, New York, April, 1914).—If seen during the early part of the paroxysm a hot mustard bath is given, ice cap applied to the head, and if the infant is having convulsions give bromide of soda and antipyrin also. If the infant is in this stage, frequent tepid spongings give great relief. The bowels should be promptly and freely opened by the use of frequent small doses of calomel. Other medicinal treatment consists in the administration of quinine, preferably bisulphate, in aqueous solution. The stomach of an infant suffering from malaria is almost invariably very irritable, and it is therefore important that quinine should be given only at those times when it will be most effective in destroying the parasites. Weston advises that in benign attacks no quinine be administered for at least three hours after the temperature becomes normal. Then administer 2 gr. bisulphate in aqueous solution every two hours day and night for twenty-four hours, then 2 gr. in solution every four hours for twenty-four hours, then 3 gr. morning and evening for three weeks. It absorbs more readily when the stomach is empty. If difficulty is found in retaining the bisulphate, euquinine or the tannate may be tried. In pernicious malaria quinine hypodermically is the only method to be relied on. The best salt of quinine for injection in Weston's opinion is the bimuriate. The tablets of bimuriate of quinine and urea are convenient and reliable. The 3 gr. tablets contain about 2½ gr. of the quinine salt. The tablet should be dissolved in distilled water or merely sterilized water. The needle and syringe must be sterile and the skin sterilized. The solution is then injected deep into the muscles. This procedure may be repeated every six hours. Finally the rectal administration of quinine may be resorted to. Here the bimuriate in doses three times as large as would be given by the mouth or intramuscularly should be given in 2 oz. of warm water. This injection should be given high up in the rectum. It is well to add 5 drops of tincture of opium to the solution to prevent tenesmus and aid retention.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 15, 1914.

SPAS IN EUROPE FOR TROPICAL RESIDENTS.

THERE is no more common question put to the doctor in warm climates, when tropical residents intend going to Europe, than "What spa should I go to on reaching home?" for Europe means "home" in a general sense to all Europeans abroad. More often than not the medical adviser has to "reserve his decision," for a confession of his complete ignorance of spas and the treatment given there is neither to his benefit nor does it help the patient. In his moments of leisure the doctor may turn to what sources of information he has at hand, and try to unravel the rival claims of spas as specific for this and that disease. He will in all probability arise from his study of spas in a mind yet more confused, for every spa seems to "cure" every ailment mentioned in the category of disease. Catarrh of every tract of the human body, and each individual organ in those tracts, is specially mentioned in almost every spa prospectus. Heart ailments, organic and functional; blood circulatory troubles; respiratory ailments, from the nose to the bronchi; kidney and bladder troubles, rickets, scrofula, anæmia, gout, rheumatism, syphilis, skin diseases—a comprehensive term—brain affections, and paralysis, infectious diseases—whatever that term implies—disorders of the pelvic organs of women, and last, but not least, "Tropical diseases." The last named is perhaps the most wonderful of all; and the doctor in the Tropics, gauging the claims of a spa to cure other diseases on the same magnificent grouping as that of tropical diseases, is quite justified in throwing his guide to spas aside and coming to the conclusion that it matters not where his patient should go. This, however, is not politic practice, and he advocates this or the other spa as the one calculated to specifically benefit the constitution of the individual he may be advising.

Where, however, with all the knowledge of the balneologist, would he advise tropical patients to go? The fact is the uses of waters of European spas were settled as means of "cure" before patients with "tropical diseases" came into the field for such treatment. The spas were instituted for diseases met with in Europe, not in the Tropics; but seeing that tropical residents seeking change in Europe have become within the past five-and-twenty years more numerous, provision had to be made for them in the advertisements, under the heading "and tropical diseases."

Having been in the Tropics folks assume that it is the liver that requires treatment, and therefore the "reducing" treatment at spas must be *the* form of "cure" required. But the doctor in the Tropics is cognizant of the fact that tropical liver conditions are in a different category to the hepatic troubles met with in Europe. The European with a liver congested and enlarged from a plethora of rich food and rare wines is one thing, and requires the stinted *régime* which is the feature of most spas; but the tropical resident coming home, after a lengthy spell in a trying climate, anæmic and played out, accustomed to food which is *not* rich, who has had "tropical chickens" as his main article of diet, and tinned food as a welcome change, does not surely require a reducing *régime* but the opposite. When one speaks of spa treatment for liver, one thinks of some Bohemian or other spa where the treatment is severe, where dietetic discipline is rigid, and where both the laity and medical men direct their thoughts when liver ailments are in question. Thither men from the Tropics used to go as a matter of course when they came "home." Many went: some were not apparently injured by the treatment, some returned and repented going, some never returned. Wiser counsels prevail to-day; the famous spas in Bohemia and elsewhere are not frequented as of yore by old tropical residents; the fashion took some time to stem, but

the medical men have not spoken in vain. Again, the custom long in vogue, when a tropical resident on returning to Britain consulted a doctor, was for the doctor to prescribe a cure at a Continental spa as a necessary part of treatment. The patient often resented the advice, saying, "That is all very well, but here am I come home on leave to my native country after a long spell abroad, and the first thing you do is to send me out of it." The man has had enough of foreign countries, and would prefer to take his chance in his native land. Moreover, there is no necessity for anyone for whom spa treatment is necessary to go out of Britain to get it.

British spas, whether as regards the variety or the quality of the waters, are as potent as anywhere in the world; the appointments and the appliances of several British spas compare favourably with the best on the Continent of Europe. The doctors at home are as well acquainted with the requisites of a spa as the professional spa medical "attendants" on the Continent. Much might be said concerning the treatment of tropical ailments at these spas by men who have never studied the subject and whose information consists of what the patient from the Tropics tells him of the signs, symptoms, and treatment of his or her disease. "And tropical diseases" at the end of the list of ailments for which any particular Continental spa is recommended requires no further comment; it is a legend which cloaks an ignorance of depths so profound that the practitioner in the Tropics may well say, "Oh! go to any spa you like." That a spa does good to almost all visitors is undoubted; so does a visit to the hills by a dweller in the plains, and the seaside benefits the inland residents in any country. A change is necessary for many animals, as evidenced by bird migrations and by the necessity for fresh blood from a distance amongst stock, whether horses, cattle or sheep. So in the same way a spa benefits; it is a change in environment, a change in the mode of living, and taking the waters does good, both physiologically and mentally, through the discipline incurred. But that a tropical resident must be sent abroad to get the "cure" is not true.

The term "cure" always sounds odd to English ears. Is the cure so certain? Do they guarantee cures at these spas? If so, then is the ailment trivial or imaginary altogether? Certain it is the spas are not meant for the treatment of serious illnesses, and it behoves really sick folk to avoid them. Moreover, no one wants them there. The visitors do not want to see sick folk sitting about; it depresses them, they say. The doctors are there only as dietetic and balneological "experts," and are not practitioners in the accepted sense, and certainly not experts in tropical ailments. The spa, on the Continent especially, is a place at which entertainments are a primary feature of the attractions, the water drinking being an addendum merely and often regarded as rather a bore by many. In Britain there are more sick folk about the spas than are to be seen on the Continent; entertainments are less considered or altogether absent; and the doctors are more clinicians than dietetic experts, and actually treat diseases as practitioners of medicine. The British spas, consequently, will commend themselves to tropical residents who seek spa treatment as a necessity, not as a luxury, and who do not wish to spend their leave away from home, but only go to a spa for relief from illness.

SPAS IN WESTERN GERMANY.

BADEN-BADEN.

A WATERING-PLACE in the Grand Duchy of Baden, with a population of some 22,000 inhabitants, is situated in a wide valley of the Black Forest. The town, surrounded by well wooded mountain ranges, rises in a succession of terraces on a hill side, and is not only beautifully placed but is also in a sound sanitary state. Some twenty mineral springs exist in the neighbourhood, of which the largest is the Friedrichsquelle. The Hauptstollenquelle is the most used for drinking and contains:—

Common salt ...	2	per mille.
Chloride of lithium	0·05	,,
Arsenate of calcium	0·0007	,,

Character of Water.—Temperature 124° to 150° F. The water may be classed as a thermal water of weak mineralization. The use made of the springs takes the following forms: (1) Baths, in the various forms of hip-baths, natural mineral running-water baths, natural steam baths, douche massage and so on; (2) drinking water cure; (3) inhalations (gargling); and (4) the use of the radium emanatorium.

Diseases Benefited.—Chronic gouty and rheumatic affections of bones and joints, certain skin affections, catarrhal affections of digestive organs in which mild treatment is indicated.

Season: May 1 to October 30.

EMS.

Ems is situated in Nassau, midway between Cologne and Frankfort-on-the-Main. The town occupies both banks of the river Lahn, which here runs through a well wooded narrow valley.

There are several springs in use, the chief constituents of which are:—

Bicarbonate of sodium ...	2	per mille.
Chloride of sodium ...	1	,,
Carbonic acid gas ...	500 vol.	,,

The Ems hot springs are the only acidulous springs in Germany which are alkaline and muriatic.

Character of Water.—Temperature 80° to 120° F., and is described as thermal muriatic alkaline water.

The waters of Ems are used for (1) baths in the form of simple thermal baths, aerated carbonic acid baths, &c., (2) douches, (3) inhalations, and (4) for drinking, according to the ailment for which they are prescribed.

Diseases Benefited.—Catarrh of the air passages including nose, larynx, and bronchi; catarrh of stomach and intestine; catarrh of the urinary passages and uric acid deposits.

Season: May to October.

KREUZNACH.

Kreuznach in Rhenish Prussia stands on the banks of the river Nahe ten miles from its junction with the Rhine. The part of the town known as Bad Kreuznach is adjacent to, but separate from, the old-world town of Kreuznach itself.

The waters contain:—

Chloride of sodium	... 1 per cent.
Chloride of calcium	... 2 per mille.
Bromide and iodide of sodium	... ... minute quantities

Character of Water.—Cold springs; the outstanding feature of the water is that it produces radium salts from its own material. Kreuznach was the first German health resort in which scientific experiments on the use of radium emanation were carefully studied.

At the spa are given inhalations, baths (including air and sun), drinking waters and douches.

Diseases benefited.—Rickets and chronic tubercular ailments of all sorts; catarrh of the throat, nose, larynx and bronchi; chronic catarrhal and inflammatory conditions of the female generative organs, and various skin affections are some of the chief affections for which the spa is patronized.

Radium treatment is a special treatment of the Kreuznach spa. At the Radium Brine Baths are provided radium baths, radio-electric air baths, &c. At the new Radium inhalatorium strong radium emanations issue from the crevices of the radium cave—a porphyritic gallery of two hundred metres in extent.

Season: May 1 to September 30.

NAUHEIM.

Bad Nauheim, in the Grand Duchy of Hesse, lies at the foot of the hills of the Taunus range. Although held in estimation as a health and spa resort for a long time it is only during recent years, by the scientific work of the brothers Schott who introduced the system known as "voluntary movements with resistance," that Nauheim has risen to high rank amongst spas.

The drinking waters are classed as belonging to the group "common salt or muriatic waters."

The *drinking water* contains several varieties of salts. The Kur-Brunnen and the Karls-Brunnen are tepid waters containing:—

Chloride of sodium	... 1 per cent.
Chloride of calcium	... 1 per mille.
Free carbonic acid gas effervescent.	

Bath water (temperature 82° to 95° F.) contains:—

Chloride of sodium	... 2 to 3 per cent.
Chloride of calcium	... 2 to 3 per mille.
Bicarbonate of iron	... A trace.
Free carbonic acid gas effervescent.	

Diseases Benefited.—Heart affections and arteriosclerosis, local blood disturbances, rheumatic affections, gout, nephritic ailments, in diseases of women, anæmia and digestive disorders. Under the direction of the Drs. Schott baths are graded and exercises charted to suit individual cases.

Season: May 1 to September 30.

NEUENAHR,

in Rhenish Prussia, possessing a thermal alkaline water (75° to 104° F.) is situated in the Ahr valley, a short distance above the town of Bonn, in the Siebengebirge mountain district. The Neuenahr springs are the largest alkaline hot springs in Germany, and of recent years have been much frequented. The waters are classified as "simple alkaline," and contain:—

Bicarbonate of sodium	... 1 per mille.
Bicarbonate of magnesium	... 0·4 ,,
Bicarbonate of calcium	... 0·3 ,,
Bicarbonate of iron	... 0·04 ,,

The waters are used as drinking waters, baths and douches; here also the usual balneo-therapeutic means of treatment are in use.

Diseases Benefited.—Catarrh of respiratory passages, catarrh of digestive tract, catarrh of the urinary passages, affections of the female sexual organs, diseases of the blood, gout, diabetes mellitus, &c.

PYRMONT,

in the Waldeck-Pyrmont principality, lies in the valley of the river Emmer, and has many methods of administering spa treatment. The waters are classed as chalybeate, and contain:—

Bicarbonate of iron	... 0·07 to 0·03 per mille.
Bicarbonate of calcium	1 ,,
Sulphate of calcium	... 0·8 ,,
Sulphate of magnesium	0·45 ,,
Carbonic acid	... ... Free.

Besides the chalybeate there are muriated water springs containing from 7 to 32 per mille of common salt.

The waters are used as baths and drinking water; and also mud, moor and peat baths are extensively used. The diseases benefited are anæmia, the catarrh of various tracts, gout, rickets, rheumatism, female sexual ailments, and functional nervous affections.

WIESBADEN,

in the Hesse-Nassau province is famous as much for its desirability as a resort as for its thermal springs, which contains common salt. The water is classed as "muriated."

The water issues at a temperature of from 100° to 156° F. and contains chloride of sodium 7 per mille. In the waters used for baths there is a faint odour of sulphuretted hydrogen. Baths, drinking water, and the usual multiplicity of applications for electricity and radium are to be had here.

The diseases for which the springs are recommended are catarrhs of all tracts, "tropical diseases," heart and circulatory troubles, rheumatism, gout, female sexual organs, &c.

WILDBAD

is romantically situated in the Black Forest, in Würtemberg, in the Enz valley. The waters rise through borings in the primeval granite, and as the baths themselves are built around the mouths of these borings the water can be used directly it issues from the ground. The water is classed as "indifferent

thermal." The water issues at a temperature of from 91° to 104° F.

Here the usual balneological appliances are in vogue. Diseases benefited are mostly of rheumatic and gouty types.

BAD WILDUNGEN,

in the Cassel—Frankfort-on-the-Main district, is in the principality of Waldeck. Its reputation as a surgical spa distinguishes it from others. The waters are classed as "earthy and calcareous." The cold gaseous springs contain :—

Bicarbonate of sodium	...	0·5 to 1·3 per mille.
Bicarbonate of magnesium		0·5 to 1·3 ,,
Bicarbonate of iron	...	0·018 to 0·036 ,,

The diseases benefited are largely those of the urinary organs. The chalybeate springs are useful in anæmia and debility.

Annotations.

Free Malarial Parasites (Mary R. Lawson, *Journal of Experimental Medicine*, June, 1914).—The malarial parasite is extracellular throughout its life cycle and migrates from red corpuscle to red corpuscle, destroying each before it abandons it; in the brief intervals between, the parasite is free in the blood serum; it does not remain long free, but almost immediately attaches itself to another red corpuscle by means of delicate pseudopodia. The compact form of the tertian parasite is the type of free parasite most often observed; in this form the parasite may be seen not only in migration, but after quinine and in the cadaver. I believe the compact form to be the normal resting form of the parasite, all other forms being assumed in order to secure attachment and to obtain food. Care must be taken not to confound free parasites having protoplasmic pseudopodia ready for attachment with the sexual flagellating parasites, whose flagella are composed of chromatin. The malarial parasite can live for some time free in the blood serum, though under normal conditions there is no reason why it should remain free for any length of time, and there are certain periods in the life of the parasite when it must be admitted that it is free from the corpuscle and survives. If the parasite is, as I believe, attached to the external surface of the red corpuscle, it is constantly exposed to the action of the patient's serum. The destruction of more than one red corpuscle by each parasite would readily account for the severe and early anæmia occurring in malarial infections. Long continued treatment with quinine will eventually cause the death of all malarial parasites.

Recognition of the Cholera Vibrio (C. V. Craster, *Journal of Experimental Medicine*, June, 1914).—Cholera-like non-agglutinating vibrios are invariably found in the intestinal contents of healthy persons, and frequently in the water of wells and rivers, during epidemics of cholera. Although many of these saprophytic vibrios are indistinguishable in morphology and cultural properties from the cholera vibrio, the negative reaction with an anti-cholera serum has readily differentiated them from the Asiatic vibrio. The biological polymorphism of the cholera vibrio has been suggested by the development of agglutination, by special methods of culture, in cholera-like vibrios. Confirmatory Pfeiffer reactions have not been obtained, as a rule, in these instances, probably because of the low virulence of the vibrio culture, although positive bacteriolysis *in vitro* (Bordet's test) was observed in some, and in others positive complement fixation and cross agglutination indicated the cholera nature of the vibrios in question.

Although it cannot as yet be definitely proven, we are justified in suspecting that cholera-like vibrios which eventually develop agglutination properties are of a true cholera nature. It is probable that the production of agglutination antibodies in the serum brings about the development by the bacterial cell of defensive anti-agglutinins, resulting in the disappearance of agglutinating power. In the case of the water vibrios, changed physical conditions could bring about a similar alteration in biological properties.

It may be said that the absence of agglutination in a vibrio isolated from a suspected source does not define conclusively its non-cholera nature. In all probability among a number of cholera-like vibrios isolated from suspected sources a certain percentage will eventually be found to develop agglutination either during laboratory cultivation or by means of animal passage, and until subjected to a procedure that will induce the return of agglutination no vibrio can be regarded with assurance as of a truly saprophytic variety.

Diagnostic Exploration of the Right Hypochondrium.—F. Lejars (*Presse Médicale*, April 25, 1914) describes three methods for diagnosing large hydatid cysts of the upper segment of the liver. The first consists in placing the left hand under the right side of the thorax of the recumbent patient and with the right hand percussing with short strokes the anterior wall of the thorax as well as the epigastrium. Transmission of waves or vibrations to the left hand through the thorax indicates the presence of cystic disease. In another procedure—suprahepatic ballottement—the left hand is placed on the anterior aspect of the thorax at the level of the second and third intercostal spaces, while the right is made to hook round the lower margin of the liver and attempt to drive it upward by a series of sharp pulls. At each pull the left hand perceives, in cystic disease, a slight impulse transmitted up toward it. The third sign—transthoracic hydatid fremitus—is elicited with the patient in the erect posture. The left hand, placed across the back below the lower angle of the left scapula, perceives, in hydatid disease, a series of light undulatory vibrations when the fifth or sixth rib is percussed anteriorly with the right index finger.

Abstracts.

RECENT RESEARCHES ON EMETINE AND ITS VALUE AS A THERAPEUTIC AGENT IN AMŒBIASIS AND OTHER DISEASES.*

By GEORGE C. LOW, M.D.

IPECACUANHA has long been known to medicine, first having been introduced into Europe in the year 1658. It soon became known that the drug exerted a beneficial influence on some forms of dysentery, and physicians practising in India used it from time to time in varying doses for this condition. Docker, in Mauritius, in 1858, increased the single dose up to as much as 60 gr. of the powdered ipecacuanha root and, according to Rogers, reduced the death-rate of the dysentery prevailing there from a former annual rate of 10 to 18 per cent. to only 2 per cent.

For some reason or other the popularity of the drug waned, the explanation of this probably being due to the fact that ordinary catarrhal and bacillary forms of dysentery are not in any way influenced by ipecacuanha, and, as at that time all forms of dysentery were looked upon as the same, many of this category must have had the ipecacuanha treatment with, of course, no beneficial effect. Sir Patrick Manson was largely responsible for its revival, the results obtained at the Branch Seamen's Hospital at the Albert Docks from 1900 onwards being excellent, and in some cases even marvellous. Large doses were given, the initial one being 30 gr. the first night, and then for subsequent ones a reduction of 5 gr. per night. The great difficulty in this treatment was, however, the vomiting these large doses excited, and many devices had to be adopted to try to prevent this.

About this time also our knowledge of dysentery advanced considerably, the amœbic forms being definitely differentiated from the bacillary, helminthic, and other varieties, and the reason of the uniform success obtained in the cases just mentioned was undoubtedly due to the fact that they belonged to the first group. Still, even though this knowledge was widely diffused and always strongly supported by Rogers and others in India, the Americans after their occupation of the Philippine Islands decried ipecacuanha, and said it was useless. So emphatic were they upon this point that one almost became forced to the belief that the amœbic dysentery met with there was different to that seen in other parts of the world, and by us here in London; our cases chiefly coming from India. We now know, however, that the Philippine dysentery is the same as the amœbic dysentery seen elsewhere, and the only satisfactory explanation that one can suggest for the different results obtained in treatment in those days is, that the Americans did not give the ipecacuanha in the proper manner or in proper doses, or were using inferior brands lacking in alkaloid. It is interesting also that one of them—Vedder—should have discovered that the alkaloid emetine is the potent part of the ipecacuanha, and so should have paved the way to a greatly improved and simpler method of treatment. Before giving a short résumé of his work it may not be out of place to give a brief description of ipecacuanha and its alkaloids.

Ipecacuanha, ipecacuanhæ radix, or ipecacuanha root, is the dried root of *Psychotria ipecacuanhæ*, a South American plant belonging to the natural order Rubiaceæ. Several varieties are used in medicine—namely, one from Rio de Janeiro, one from Minas, Brazil, another from Colombia (Carthagena ipecacuanha), and what is known as Indian ipecacuanha, this being the South American plant grown in the Straits Settlements, where it has been introduced. In the United States Pharmacopœia the Brazilian plant is named *Cephaëlis ipecacuanha*, while the Colombian one is said to belong to another species, *Cephaëlis acuminata*. The British Pharmacopœia only describes the Rio root, and this is not required to yield any definite percentage of alkaloids. The United States Pharmacopœia includes both the Rio and Carthagena roots, and further requires the presence of 1·75 per cent. of ipecacuanha alkaloids to be present in these. The alkaloids found in ipecacuanha root are emetine, cephaëline and psychotrine, and give in the Brazilian variety a percentage of from 2 to 2·2 per cent. The relative percentage composition of these in Brazilian and Colombian ipecacuanha is, according to Paul and Cowley, as follows: Brazilian—emetine, 72·14 per cent. of the total alkaloid; cephaëline, 25·87 per cent.; psychotrine, 1·99 per cent. Colombian—emetine, 40·5 per cent.: cephaëline, 56·8 per cent.; psychotrine, 2·7 per cent. It will thus be seen that Colombian root contains much less emetine than Brazilian, and, as will be pointed out later, its use may have contributed to the diversity of views regarding the efficacy of the drug in the treatment of dysentery. Selangor (Straits Settlements) ipecacuanha approximates to the Brazilian, also containing more emetine than cephaëline.

The name emetine used to be applied to an impure extractive containing the mixed alkaloids of ipecacuanha; this impure mixture is now termed emetine (extract).

Emetina (more usually spoken of as emetine) is a colourless white powder, darkening on exposure and slightly soluble in water, though it is readily so in alcohol, ether, chloroform and benzine; two salts of it are in medical use—namely, the hydrobromide and hydrochloride. The drug is a powerful emetic and expectorant, but to get these results must apparently only be given by the mouth.

Cephaëline is also colourless, but crystalline, and darkens on exposure to light. It is less soluble in ether than emetine, but is readily so in caustic alkaline solutions. One salt is known, the hydrochloride. Its medical properties are similar to those of emetine, it being a stronger emetic, but a less powerful expectorant.

On February 6, 1911, Captain Edward B. Vedder, Medical Corps, United States Army, read a paper

* *Proceedings of the Royal Society of Medicine*, 1914, vol. vii (Therapeutical and Pharmacological Section), pp. 41 to 49.

before the Manila Medical Society, entitled "A Preliminary Account of Some Experiments undertaken to test the Efficacy of the Ipecacuanha Treatment of Dysentery."* After some preliminary remarks on the divergence of opinion as to the value of this drug in dysentery Vedder passed on to a description of his experiments. These were undertaken with a view of determining: (1) Whether ipecacuanha has any decided action against either the bacilli of dysentery or such amœbæ as can be cultivated: (2) if such action be present, to determine how the drug compares with other remedies that have been used in the past, such as quinine and silver nitrate; and (3) to determine to what constituents of the ipecacuanha this action is due. As regards dysentery bacilli it was found that a 2 per cent. fluid extract of ipecacuanha inhibited their growth, but this was not a specific action, as it was also obtained with other bacteria, while other drugs, such as hydrastis and digitalis, acted in a similar manner. Shiga's bacillus was more susceptible than Flexner's.

Two entamœbæ may be found in the intestine of man: (1) the *Entamœba coli*, supposed to be harmless; (2) the *E. histolytica*—the *E. tetragena*—the cause of amœbiasis and amœbic dysentery. These so far have not been cultivated outside the human body, so Vedder had to fall back upon cultures of amœbæ isolated from tap-water for his experiments. It was soon found that fluid extracts of ipecacuanha were very toxic to these organisms *in vitro*, dilutions of 1 in 50,000 or even in some instances higher ones, killing them off very rapidly. Emetine was next tried and was found to be still more toxic, dilutions of 1 in 100,000 being sufficient to cause death of the organisms. Vedder finally concluded from this part of his work (1) that ipecacuanha is a powerful amœbacide, since the weakest preparation used (with the exception of the de-emetized) killed in a dilution of 1 in 10,000; (2) that different preparations of ipecacuanha on the market vary greatly in their ingredients and in the power of killing amœbæ; (3) that emetine is a powerful amœbacide, killing amœbæ in dilutions of 1 in 100,000, which is double the dilution that was amœbacidal when fluid extract of ipecacuanha was used. The author, further, was of the belief that the power of any specimen of ipecacuanha to kill amœbæ was directly dependent upon the proportion of emetine contained in it, though he could not absolutely prove this owing to the presence of the other alkaloid, cephaëline. He thought, however, that if the latter was at all active it would be possible to judge of the amœbacidal properties of a preparation by estimating the total alkaloidal content, but apparently no such activity was present, because a sample of ipecacuanha with a total alkaloid content of 0·885 appeared to be fully as powerful as another containing 1·8 total alkaloid. Further, it was noted as a clinical fact that the Brazilian root—which, as I have already pointed out, contains much more emetine than the Colombian—was much more potent than the latter in the treatment of dysentery, and Vedder concluded—a conclusion afterwards proved to be correct—that this was due to the larger amount of emetine contained in it. Other constituents of ipecacuanha root, such as resins, gums, or ipecacuanhic acid, were proved to be absolutely inert, as was also ipecacuanha from which the emetine had been extracted (ipecacuanha sine emetina). Experiments were also conducted with quinine and silver nitrate. Quinine in a dilution of 1 in 20,000 killed the amœbæ, but failed in higher dilutions. Silver nitrate was more powerful even than emetine, killing in dilutions of 1 in 300,000. In actual practice, however, irrigations of the latter quickly lose their strength because of the union of the salt with the albumin and NaCl in the mucous membrane of the intestine. Vedder also tried the action of ipecacuanha on a species of paramœcium and a balantidium isolated from tap-water. Both of these forms were killed by ipecacuanha in a dilution of 1 in 50,000 and by emetine in a dilution of 1 in 100,000. This experiment was suggested to him by the report by Duncan of a case of balantidial dysentery in man treated by ipecacuanha with prompt recovery.

It fell to the lot of Rogers, in Calcutta, to put Vedder's experimental work to the clinical test—namely, by treating cases of amœbic dysentery in man by emetine. This was not, however, the first time that this drug had been used for such a condition, Bardsley, in 1829, employing it in some forms of dysentery and diarrhœa with excellent results, while Walsh tried it in 1891 combined with mercuric iodide by the mouth, also with good result. Rogers, on learning of Vedder's work, tested the effect of the soluble emetine hydrochloride on the *Entamœba histolytica* in dysenteric stools. On placing pieces of mucus containing numerous active amœbæ in normal saline solutions of this salt, he found that the pathogenic organism is immediately killed and materially altered in its microscopical appearances by a 1 in 10,000 solution, while after a few minutes they are rendered inactive and apparently killed by as weak a solution as 1 in 100,000. He then decided to try if the alkaloid could be safely given hypodermically in the treatment of amœbic disease, and having a suitable case, injected $\frac{1}{6}$ gr. of the hydrochloric of emetine, this equalling 15 gr. of ipecacuanha. No local irritation followed the injection, nor was any nausea or vomiting produced. Four hours later $\frac{1}{3}$ gr. was injected, again with no ill-effects, not even temporary depression of the pulse. The patient's symptoms quickly disappeared and recovery took place. In the second case the patient was greatly emaciated and was passing over twenty foul-smelling stools of pure mucus and blood daily. He was quite unable to take ipecacuanha by the mouth, so $\frac{1}{6}$ gr. of emetine hydrochloride was injected. This was rapidly increased to $\frac{1}{3}$ gr. twice daily. On the second day the blood had disappeared from the stools and fæcal matter reappeared in them. Here, again, no discomfort of any kind followed the injection of the emetine. In another case the dose of the drug was increased up to $\frac{1}{2}$ gr. to 45 gr. of ipecacuanha—with no untoward results.

* Journ. of Trop. Med. and Hyg., 1911, p. 149.

In a subsequent paper * Rogers gave details of another twelve cases of amœbiasis, viz., acute and chronic amœbic dysentery, acute hepatitis, and amœbic abscesses of the liver and spleen. These were all treated by emetine injections, the abscesses at the same time being aspirated. The records of the cases showed that in the hypodermic use of emetine a valuable method of treatment had been discovered—a treatment which robbed the old ipecacuanha one of all its terrors and discomforts. By his observations in these cases Rogers was also able to definitely decide the matter of dosage. Either the hydrochloride or the hydrobromide salt can be used, but as the first is more soluble in water it is the one chiefly employed. At first $\frac{1}{3}$ gr. was used, but later this was increased to $\frac{1}{2}$ gr., or even up to $\frac{2}{3}$ gr., this equalling 60 gr. of ipecacuanha. In two cases 1-gr. doses were injected, but such a quantity is only required in extremely acute cases. The salts can be safely boiled for a very short time, but Rogers believed that it was better to dissolve them in sterile saline, or to boil the solution first and then add the emetine salt. They are generally obtainable in sterile ampoules now. As a result of his observations, Rogers concluded that in emetine we have a specific treatment for amœbic hepatitis and amœbic dysentery.

Confirmation of these results were quickly obtained. The drug was given a trial at the Seamen's Hospital, Albert Docks, and proved equally satisfactory. Chauffard introduced it into France, and since that time a large literature has sprung up about it, many people recording their treatment of cases by it.

An analysis of these cases with one's own experiences of the drug enables one to come to certain conclusions. Emetine is not a specific in the sense that it completely sterilizes the body from amœbæ. Relapses after its use occur, and these are by no means infrequent. The drug may be compared with mercury and salvarsan in syphilis and quinine in malaria, where, again, even after long periods of treatment, relapses or recrudescences are met with. Protozoal infections are always very difficult to eradicate, and when anything detrimental to the parasites causing them happens, forms arise which are specially resistant, and though remaining quiescent for long periods of time are capable, under circumstances favourable to themselves, of giving rise to the disease again.

In amœbic dysentery the amœbæ become encysted, and then apparently the emetine cannot kill them, this stage being a very resistant one. At later periods these become transformed into the living forms again, and so produce relapses. Treatment, therefore, for amœbiasis must be conducted on similar lines to that of malaria by quinine. Suitable doses must be given and kept up for prolonged periods of time. I therefore give $\frac{1}{2}$ gr. doses of emetine hydrochloride until 10 gr. in all have been taken. Then, if all symptoms have abated the drug is stopped and the patient kept on a strict diet. Some cases, even after this, relapse, and then a second course of the emetine has to be given, and so on. Sometimes injections are inconvenient, and in these instances keratin-coated "tabloids" may be tried.† My experience of these is that some patients can take them without vomiting or any unpleasant symptoms; others are sick for the first day or two, then tolerate them; while a third group keep on being sick each time they take them. In this latter class injections must be substituted. The dose by the mouth is $\frac{1}{3}$ to $\frac{1}{2}$ gr., and if not vomited is quite as effective as injections. As regards the latter, it is more satisfactory to inject the drug intramuscularly than subcutaneously. Some stiffness may even then result, so it is well to vary the site of the injection. Some cases do not do so well with emetine as others. I recently saw a case where the stool still showed blood and mucus after twenty $\frac{1}{2}$ gr. injections, and another whose stool was teeming with cysts after a short course of the drug. The efficacy of the treatment is tested by frequent macroscopic examination of the stools to see if all blood and mucus has disappeared, by the number of motions passed per day, and by microscopic examination for the entamœbæ from time to time; these usually disappear very quickly from the stools after the first two or three doses have been taken.

In addition to the emetine treatment a milk diet first and then later a milk and white meat diet must be insisted upon, and no alcohol in whatever shape or form is to be allowed. The patient should remain a teetotaller for a year or more after all signs of the disease have disappeared.

Amœbic abscesses discharging through the lung or discharging externally are greatly benefited or even cured straight away, without surgical interference, by emetine. When an amœbic abscess is opened and drained, emetine injections should be started at once as they will help greatly in the healing process.

Cases of amœbiasis without signs of dysentery or hepatitis or abscess have also been met with. In these there is a high temperature, this quickly falling, however, and all other signs disappearing on the administration of emetine.

Balantidiasis: The part played in this disease by ipecacuanha and emetine has already been described.

In addition to its use for dysentery, injections of emetine have lately been tried in the treatment of hæmoptysis and intestinal hæmorrhages. Flandin, in France, impressed by the prompt disappearance of blood from the stools in cases of amœbic dysentery treated by injections of the soluble salts of emetine, suggested the possibility of the drug being similarly effective in hæmoptysis. Eight cases of this condition were treated, and in all of these, with the exception of a galloping case of tuberculosis, the hæmorrhage was definitely arrested, the bleeding stopped immediately. No bad symptoms, such as nausea or depression, followed the administration of the drug. In some cases, though all traces of blood may disappear from the sputum, blackish clots may remain for some time. If, after one injection, there is a tendency for the hæmorrhage to return, Flandin

* *Brit. Med. Journ.*, 1912, ii, p. 405.

† *Brit. Med. Journ.*, 1913, i, p. 1369.

gives a second injection twelve hours later, and again on the following day. His dosage was 0·04 c.c. of emetine hydrochloride dissolved in 1 c.c. of distilled water. The arterial pressure was taken both before and after the administration of the drug, but no change was noted either in it or in the coagulation of the blood, or in the blood count. These results were confirmed in twelve other cases by other physicians, while Renon also succeeded in obtaining the disappearance of blood from the sputum in two cases of lung carcinoma by the same treatment. The latter observer later tried emetine injections for serious intestinal hæmorrhages. He quotes Valassopulo, of Alexandria, and Edham, of Salonica, as having obtained good results from these in hæmorrhage from a carcinoma of the large intestine, and from a case of muco-membranous entero-colitis. In his own experience five cases of severe intestinal hæmorrhage, including hæmorrhage due to biliary and hypertrophic cirrhosis, hæmorrhage after typhoid and ulcerative entero-colitis and chronic nephritis, were treated with rapid and excellent results. He finally states that Raymond also was successful in dealing with hæmorrhage of the stomach from a single ulcer and from a neoplasm, with severe intestinal hæmorrhage after typhoid. Renon advises doses up to 9cg.

These results would seem to indicate that in emetine we have a useful means of arresting hæmorrhage. Why this should be is not altogether clear, but as it has been stated that the drug exerts a powerful local constricting effect upon blood-vessels it is possible that this is the explanation of its action in these cases.

HYDATID DISEASE OF THE LUNG SPONTANEOUSLY CURED.*

By A. G. Yates.

The patient, a married woman, aged 26, first came under observation in June, 1913. She had never lived abroad, and until the onset of her illness had enjoyed good health. Her first symptom was a sudden attack of hæmoptysis which was not profuse. Cough and some pain in the chest persisted for a week, and then passed off. She had no further symptoms for a month, when she again coughed up blood and with it a quantity of membrane. When examined a few hours afterwards she looked somewhat anæmic but otherwise normal; there was slight dyspnœa, but no fever. Examination of the chest revealed a small area of dullness in the first left intercostal space close to the sternum; it extended to the left for 2 in. There was a dilated vein running up to this region from the left breast. There were no râles, but the breath sounds over the dull area were high pitched and bronchial in character, and pectoriloquy was well marked.

The expectoration contained no tubercle bacilli, but the membrane showed a characteristic laminated structure, and there were numerous hooklets. A differential count of the leucocytes showed 5 per cent. of eosinophiles. After bringing up the membrane all symptoms rapidly subsided, and in a few days she was apparently well.

When seen again, nearly a year after the first onset of symptoms, she was perfectly well; the dullness and bronchial breath sounds were no longer present, and there were no abnormal signs in any part of the chest. A skiagram of the whole chest showed nothing abnormal. Examination of the liver and other organs revealed nothing.

It is clear that the condition was a small cyst which ruptured into the left bronchus and was expelled. The symptoms at the time of rupture were extremely mild, there was no suppuration, and down to the present time there has been no evidence of recurrence.

* *Brit. Med. Journ.*, June 13, 1914.

HUMAN ACTINOMYCOSIS IN PERU.†

By E. Escomel.

Human actinomycosis, very rare in Peru, has never previously been recognized in Arequipa. This is the first recorded case in Peruvian literature with a definite microscopic diagnosis.

A man, aged 19, in May, 1912, contracted bronchopneumonia with gastro-intestinal relapses causing delayed convalescence. In the expectoration there were no Pfeiffer bacilli, tubercular bacilli, or mycelium. At length the patient was sent to Cuzco where he rapidly convalesced and was occupied in packing hides for Europe. In the department of Arequipa, actinomycosis has not previously been recognized, while at Cuzco it is often present.

While at work the cough returned, the patient lost weight, was feverish and felt a pain at the right posterior inferior area of the thorax at the level of the eighth intercostal space.

He returned to Arequipa on November 23, 1912, with a temperature of 39·6°C., but was able to walk without pain. The lump on the back became prominent and fluctuated. The expectoration contained no tubercle bacilli. The tumour was punctured and a thick, gelatinous, chocolate-coloured fluid was obtained, which contained no tubercle or recognizable microscopic organism. Inoculated into a guinea-pig the animal was found normal when examined four weeks later.

Incision of the tumour produced reddish pus resembling hepatic pus. A finger passed through the diaphragm into a cavity in the liver. Irrigation of the wound caused the patient to cough and spit up some of the irrigating fluid. The abscess involved the basis of the right lung, the pleura passing through the diaphram to the liver.

Two days later the pus from the wound contained granular bodies the size of a pin's head which, under the microscope, freshly stained by Giemsa, showed actinomycosis. A new abscess formed and infiltrations were noticed under the abdominal wall. Finally invasion of the kidneys caused death more than a year after the commencement of the disease. Iodide of potassium was given from 3 grm. up to 12 and 15 grm. daily for two months without producing any effect and without producing iodism.

† *Bull. de la Soc. de Path. Exot.*, 1914, vii, No. 5.

Reviews.

TEXT-BOOK OF LOCAL ANÆSTHESIA FOR STUDENTS AND PRACTITIONERS. Professor Dr. Georg Hirschel, Heidelberg, Assistant in the Surgical Clinic. With an introductory preface by Professor Dr. Wilms. 103 illustrations in the text. Translated by Ronald E. S. Krohn, M.D.Lond. London: John Bale, Sons, and Danielsson, Ltd., 83, Great Titchfield Street, W. 9s. net.

Although much has been written on "Local Anæsthesia" this is an essentially up-to-date description of "infiltration-anæsthesia" mainly for operations, but also for therapeutic purposes as "Trigeminal Neuralgia."

A full account is given of the preparation of the patient, instruments and drugs used. The second section of the book is devoted to "Regional Anæsthesia," for cranial operations, operations on the face, dental operations, anæsthesia of the neck, chest and breast, kidney and abdominal operations.

A special feature of the work and one of marked utility is the use of infiltration anæsthesia for abdominal operations and also extradural anæsthesia through the sacral canal.

Though local anæsthesia is not as much used by English surgeons, yet there is a large field for its use both at home as well as in the Tropics, so that a well translated exposition of the most recent information will be found to supply a need felt by both surgeons and dentists.

HINTS FOR RESIDENTS AND TRAVELLERS IN PERSIA. By A. R. Neligan, M.D., M.R.C.S., D.T.M.Cantab., Physician to His Majesty's Legation at Tehran, with map. 1914. London: John Bale, Sons and, Danielsson, Ltd., 83, Great Titchfield Street, W. 5s. net.

Although there are many books by medical and other travellers on Persia, with jottings and hints on medical matters, this is the first one exclusively devoted to medicine for travellers and residents in that country, which perhaps is not to be wondered at considering that many parts of Persia are distinctly healthy and afford a pleasing holiday to Anglo-Indians and in former times was a much frequented road home. Although the work is mainly intended for the rich, able to supply themselves with comforts and luxuries, yet it is a booklet that should be found amongst the light baggage of all who go to Persia, and not least those with families whose lot it is to reside there, as they will find it not only an aid to health but also conducive to comfort. The strong binding and rounded corners will enable the book to stand much use and wear.

The instructions would prevent the diseases known to prevail in Persia; but what is more important to timid travellers, should allay all dread of diseases which are not known there.

A SYSTEM OF SURGERY. Edited by C. C. Choyce, B.Sc., M.D., F.R.C.S., and J. Martin Beattie, M.A., M.D., C.M., Pathological Editor. 3 vols. 48 colour plates, 80 black-and-white plates, 950 illustrations in the text. Waverley Book Company, Ltd., 7, 8 and 9, Old Bailey, E.C. £3 3s. Cassell and Co., London, New York, Toronto and Melbourne.

This "System of Surgery" is especially designed for the practitioner who wishes to keep himself abreast with the most modern surgical teaching, and for the student who aims at a sound comprehensive knowledge of present-day surgery.

It furnishes a clear, detailed, and concise record of modern surgery. The special feature of this book, written by various authors, is that it is all practical and there is no over-lapping.

Where everything is excellent, it is hard to individualize, but one may remark that the results of most recent work are given, as details connected with new growths and tumours, examination of blood and cerebro-spinal fluid, yaws, leprosy and other tropical diseases.

It is only fair to mention that the plates and illustrations are of a very high order

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FORMULAIRE DE THÉRAPEUTIQUE CLINIQUE. Par le Dr. L. Pron, Membre de la Société de Thérapeutique, avec la Collaboration du Dr. A. Cantonnet, Ophtalmologiste des Hôpitaux de Paris (Hôpital Cochin). Deuxième Edition, refondue et augmentée. Paris: Librairie Maloine, 27, Rue de l'Ecole de Médecine, 1914. Prix 6 fr.

This is a distinctly useful and interesting formulary by an Algerian. The diseases are treated alphabetically, and appropriate descriptions and directions given. Thirty-two pages are devoted to diseases of the eye, the importance of which is very often neglected by students, until too late they meet cases that refuse to react to the usual remedies.

A TEXT-BOOK OF MEDICAL ENTOMOLOGY. By Walter Scott Patton, M.B.Edin., I.M.S., and Francis William Cragg, M.D.Edin., I.M.S. Pp. 764 + xxxiii, cr. 8vo, with 89 plates. 1913. London, Madras, and Calcutta: Christian Literature Society for India. £1 1s. net, or Rupees 15.2 net.

The abiding impression of the study of this work is that it will be most useful to all interested in medical entomology, both as a text-book as well as work of reference, and it is to be hoped will attain success both in the Tropics and elsewhere. The authors deal with all entomological details connected with insect-borne diseases. The methods of recognizing insects, their method of collection, the manipulation of insects in the laboratory, natural and artificial methods of breeding. Copious illustrations, both original as well as those obtained from the most recent authorities, are characteristic of the work. All the most recent information on the subject is enumerated. The authors have accomplished the by

no means easy task of condensing the information supplied by the standard works of Austen, Nuttall, Graham Smith and others. In addition there is well balanced suggestive speculation on the causation and prevention of disease; the various hypotheses are well supported by facts. The essential features of this encyclopædic work are clear, anatomical descriptions and well balanced theories.

BOOKS RECEIVED.

TROPICAL DISEASES. By Sir Patrick Manson. Fifth Edition, enlarged. Cassell and Company, Ltd., London, New York, Toronto and Melbourne.

THE PRACTICE OF SURGERY. A Text-book. By Russell Howard, M.S., F.R.C.S. London: Edward Arnold, 41 and 43, Maddox Street, W.

Extracts from Medical Papers.

(1) Recent opinion is inclining to the supposition that influenza, tonsillitis, acute rheumatism, and appendicitis are all related and of almost identical origin.—W. Wilson, *Practitioner*, June, 1914, p. 773.

(2) Status lymphaticus can be diagnosed by enlargement of lymphatic nodules at the sides of the pharyngeal part of the tongue.

(3) Whoever advises non-operative treatment of adenoids assumes a tremendous responsibility.

Notes and News.

SEAMEN'S HOSPITAL SOCIETY, ALBERT DOCK HOSPITAL.

UNVEILING BY THE SECRETARY OF STATE FOR THE COLONIES OF BRONZE PORTRAIT RELIEFS, JUNE 23, 1914, ERECTED BY THE COMMITTEE TO COMMEMORATE THE SERVICES RENDERED BY MR. JOSEPH CHAMBERLAIN AND MR. AUSTEN CHAMBERLAIN TO THE ALBERT DOCK HOSPITAL AND THE LONDON SCHOOL OF TROPICAL MEDICINE.

Mr. Perceval A. Nairne, Chairman of the Committee of Management, will receive Mr. and Mrs. Lewis Harcourt, Mrs. Joseph Chamberlain, Mr. and Mrs. Austen Chamberlain, and other visitors at 4 o'clock. Mr. Lewis Harcourt will then unveil the Bronze Portrait Reliefs, designed and executed by Mr. F. W. Doyle Jones, and will address the meeting. He will be followed by Mr. Austen Chamberlain. The Hospital and the School will be open to inspection, and various pathological and other specimens connected with tropical diseases will be shown under the microscope. Tea will be served at 5 o'clock.

The Seamen's Hospital Society was founded in the year 1821, for the care and treatment of ill and injured sailors of all nations. Until 1870 the sole hospital maintained was the old three-decker "Dreadnought" moored in the river off Greenwich; but in that year the whole establishment was moved ashore to the old Infirmary of Greenwich Hospital.

In the year 1889 it became clear that the vast area of the Port of London could not be served by a single hospital, and it was decided to build a small hospital in the Albert Dock. The foundation stone was laid by H.M. King George, then Duke of York, on July 15, 1889, and the wards, containing twenty beds, were opened by King Edward VII and Queen Alexandra, then Prince and Princess of Wales, in the following year. From this small beginning the present hospital and school have sprung.

Early in the year 1898 a letter was received from Mr. Joseph Chamberlain, then H.M. Secretary of State for the Colonies, suggesting the enlargement of the Albert Dock Hospital and the establishment of the London School of Tropical Medicine, in order that newly appointed medical officers of the Colonial Service might receive systematic training in tropical diseases.

Sir Patrick Manson, one of the Physicians of the Albert Dock Hospital and Medical Adviser to the Colonial Office, supported Mr. Chamberlain's application, which was sympathetically received by Mr. Perceval A. Nairne, then, as now, Chairman, and by the Committee of Management. Mr. Chamberlain's suggestions were adopted, and he presided at a dinner in the year 1899 when £15,000 was subscribed, a sum which made it possible to establish the first tropical school with accommodation for twelve students.

In the year 1905 Mr. Chamberlain again presided at a Banquet, which resulted in £10,000 being received. On this occasion the Hospital was enlarged to fifty beds and the accommodation in the School doubled.

Various additions were made subsequently, until two years ago, when Mr. Lewis Harcourt, Secretary of State for the Colonies, invited Mr. Austen Chamberlain to carry on the work so ably and successfully initiated by his father. He suggested that a fund should be raised to place the School in a sound financial position by providing money for the enlargement and endowment of the School, for research, for a hostel for the accommodation of students, and for the endowment of hospital beds.

To this end Mr. Austen Chamberlain issued his appeal and a sum of £73,000 was received. Of this amount £52,000 has been invested for endowment and research, £15,000 has been spent upon buildings, and £6,000 upon the endowment of six beds in which officers and others suffering from tropical disease whose means are limited may come to this country to be treated under the most favourable conditions.

At Mr. Chamberlain's special request arrangements have been made whereby patients who can afford it are admitted on payment of a reasonable sum for maintenance and treatment.

At the present time the hospital has fifty beds, of which about half are available for tropical diseases.

The school has accommodation for about eighty students, and about 200 pass through the curriculum

every year, while there is residence in the hostel for eighteen students.

It is with the hope of conveying some expression, however slight, of their gratitude for the great services rendered by Mr. Joseph Chamberlain and his son to the Albert Dock Hospital and the London School of Tropical Medicine that the Board of Management of the Seamen's Hospital Society erect these portraits.

A NEW VARIETY OF COFFEE.

FROM the Congo a variety of the coffee plant *Coffea robusta*, discovered by Emile Laurent in 1898, is gradually finding its way into coffee-growing countries. The name given to the plant is to distinguish its robust characteristics, inasmuch as it is less liable to be attacked by disease than either of the two older varieties, *C. arabica* and *C. liberica*. In fact the *C. arabica* is going out of cultivation in Java, Guadeloupe and elsewhere owing to the uncertainty of the crops on account of disease, but the immunity possessed by the *C. robusta* is making the plant a favourite everywhere.

SIR RONALD ROSS'S WORK.

SIR RONALD ROSS'S action in forwarding a petition to the Chancellor of the Exchequer, asking Parliament for some recognition of his discoveries as to the mode of infection of malaria has been commented upon as follows by Professor W. J. R. Simpson, C.M.G. "I am certainly of opinion," he said, "that those men who have benefited the British Empire and humanity by their researches should have some chance of being placed in fairly easy circumstances. Consider, for instance, what has happened with regard to Dr. Haffkine's prophylactic for plague in India. He is engaged by the Government of India as one of its officers, and his prophylactic is used both in that country and elsewhere. The Government of India actually makes money by selling it, but apart from his salary and the fact that he will probably eventually retire on a small pension he gets no benefit out of his discovery. The medical man is placed in a very different position from that occupied by the engineer. Lord Kelvin's discoveries were of immense value to the world, but by patenting them he received a large revenue, and died a rich man. The same can be said of the discovery of wireless telegraphy, and so forth. Medical men cannot act in that way and patent their discoveries, nor is it desirable that they should, for it would lead to quackery. The fact remains however, that they spend an enormous amount of time on their investigations, make their results public, and get the credit of the discovery, but nothing further. What reward, for instance, has Sir David Bruce ever received for the investigations that cleared Malta of what till recently was known as 'Malta fever'? Sir Patrick Manson, again, who was the pioneer in connection with the mosquito and malaria by his researches on the way in which the filaria were spread by the mosquito in filariasis, received no grant in recognition of the value of his work."

"In the article published in the *Morning Post* I notice that you have indicated the great benefit to India of Sir Ronald Ross's work. Its value, of course, extends far beyond India. The Panama Canal could never have been constructed if that work had not been done. The knowledge that the mosquito carried malaria led to the American work on yellow fever, and the application of the results obtained enabled General Gorgas to make the Panama zone so healthy that the American engineers could carry out their magnificent work. The French engineers would have been quite capable of doing the engineering feat, but they lost 50,000 men while they were engaged on it, and had to abandon it, simply because their attempt was made before Sir Ronald Ross had done his work. For this reason one feels that the nation should look on his work as being of an exceptional character, and should recognize it. At present nothing is given. Everything is left to be done by the man personally, often at very considerable expense. To this general statement I should make the qualification that the Colonial Office is beginning to adopt a rather different attitude, and some money is being set aside to send out commissions of inquiry and to enable investigations into the causes of disease to be undertaken. It should be remembered that discoveries of the sort that demand signal recognition from the nation are not many, the work done on sleeping sickness by Sir David Bruce and Dr. Castellani having to be added to the other examples I have mentioned. That adequate rewards should be given for research is to my mind of very great importance. The fact that there are no such rewards is having a very bad effect on medicine in this country, for the younger men will not undertake research. I have not given much consideration to the question as to what would be the best method of arranging that the rewards should be available, whether by Nobel prizes, by petitions to Parliament, or otherwise, but in the present case of Sir Ronald Ross, I think that he is doing a public service in presenting a petition to Parliament on the same lines as those followed in the case of Jenner."

LIVINGSTONE COLLEGE.

SATURDAY, June 13, 1914, was Commemoration Day at Livingstone College.

The Bishop of Chelmsford, in the Chair, expressed his great pleasure in being present. He desired to bear testimony to the work of his old friends, Dr. and Mrs. Harford, at Livingstone College, whom he had known intimately through the fact that Livingstone College carries on the St. James-the-Less Medical Mission in Bethnal Green. As one who travelled throughout the world he recognized the immense importance of medical knowledge to a missionary, and whilst it might be said that "a little knowledge is a dangerous thing," yet he felt that it was absolutely essential that men going abroad should have such training as was carefully given at Livingstone College.

Dr. Ernest Cook spoke as a medical missionary of

the Church Missionary Society from Central Africa, and he gave an instance of a case where a Livingstone College student had saved the life of a Roman Catholic Father in Uganda who was suffering from blackwater fever in a place where no doctor could be obtained. He spoke of the many dispensaries that are scattered through the Uganda Protectorate, where immense benefit is conferred upon the people of the country, who are without any medical knowledge, and for such work missionaries needed training such as was given at the College.

Rev. E. W. T. Greenshield, an old student of the College, is well known for his heroic labours among the Esquimaux. His dental experience had stood him in good stead not only in helping the Esquimaux, but actually in his own case, and he told how he had had to pull several of his own teeth. On one occasion he had no proper dental forceps, and he had practically to dig out the offending tooth, but he was suffering very keenly not only from toothache but from hunger, so that he was compelled to remove the tooth even though he took half an hour to do so. By means of his medical knowledge he had been able to gain the confidence of some of the rough crews with whom he had sailed in the Arctic regions and who had thought little of the parson until they found what he could do for their bodies, when he gained their confidence and respect.

The Esquimaux were absolutely ignorant of the most elementary knowledge of medical treatment. They would cut open an abscess with the foulest knife and put on a dressing of raw seal-skin. It was therefore a tremendous boon to these people to treat them by proper surgical measures. He paid a very warm tribute to the help which he had received from his college training.

Rev. E. H. Clark, a Missionary of the London Missionary Society from Tanganyika, stated that the training he had received had not only benefited himself and his family, but had been of the greatest use to the people of Central Africa amongst whom he worked. He was in a place where there were swarms of anopheles which carry malaria which he knew must breed in a swamp. He found out the swamp and was able to drain it, and by that means he had benefited the whole countryside, and what was formerly a most malarious region was now entirely a different place.

At the conclusion of the meeting, the Treasurer, in the name of the Committee and Staff, and Students, past and present, made a presentation to Dr. and Mrs. Harford of a silver rose-bowl, an album containing photographs of the groups of all old students, and a cheque for £100.

Rev. H. H. Heaton, senior student of the College, also spoke as representing present and past students who had contributed to the testimonial.

Dr. Harford expressed the very hearty thanks of himself and Mrs. Harford for the handsome gift which had been given to them, and his earnest appreciation of the good wishes of his colleagues on the staff and on the committee, and of past and present students.

The Bishop, in response to the vote of thanks, referred to the great financial needs of the College, which are set forth in the Year-book, in which an appeal is made for £10,000. Towards this sum £789 is available from contributions that have already been given. The Bishop hoped that the amount might be fully met. He then closed the meeting with the Benediction.

THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE, IMPERIAL INSTITUTE, LONDON, S.W., JUNE 23-30, 1914.

Patron.—HIS MAJESTY THE KING.

President.—Professor Wyndham R. Dunstan, C.M.G., LL.D., F.R.S., President of the International Association for Tropical Agriculture, Director of the Imperial Institute.

REPRESENTATIVES AND DELEGATES.

United Kingdom: Board of Agriculture.—Sir Sydney Olivier, K.C.M.G., Permanent Secretary to the Board.

British Cotton-Growing Association.—Mr. W. H. Himbury, Mr. C. M. Wolstenholme, Mr. R. W. Brown and Mr. J. Percival.

International Federation of Master Cotton Spinners' and Manufacturers' Associations.—Sir Charles Macara, Bart., and Mr. Arno Schmidt.

London Chamber of Commerce.—Sir Owen Philipps, K.C.M.G., Mr. J. H. Batty, Mr. W. Soper and Mr. C. E. Musgrave.

India: Dr. C. A. Barber, Sc.D., F.L.S., Government Sugar-cane Expert.

United Planters' Association of Southern India.—Mr. R. D. Anstead, B.A.

Ceylon: Department of Agriculture.—Mr. R. N. Lyne, Director of Agriculture.

Ceylon Agricultural Society.—Dr. H. M. Fernando, M.D., and Dr. W. A. de Silva.

Low Country Products' Association.—Mr. J. Peiris, B.A., LL.M.

Federated Malay States: Planters' Association of Malaya.—Mr. H. M. Darby.

Jamaica: Sir Sydney Olivier, K.C.M.G.

Trinidad: Department of Agriculture.—Professor P. Carmody, Director of Agriculture.

Agricultural Society of Trinidad.—Lieutenant-Colonel Collens, V.D.

British Guiana: Mr. G. E. Bodkin, B.A., Economic Biologist in the Department of Science and Agriculture.

Leeward Islands: Mr. H. A. Tempany, B.Sc., F.I.C., Superintendent of Agriculture.

Nigeria: Department of Agriculture.—Mr. W. H. Johnson, Director of Agriculture, Southern Provinces.

Gold Coast: Mr. W. S. D. Tudhope, Director of Agriculture, and Mr. T. F. Chipp, Assistant Conservator of Forests.

Sierra Leone: Mr. A. C. Hollis, Colonial Secretary, and Mr. W. Hopkins, Director of Agriculture.

Nyasaland: Mr. J. S. J. McCall, Director of Agriculture.

Rhodesia: Mr. C. D. Wise, Director of Land Settlement.

Anglo-Egyptian Sudan: Mr. H. P. Hewins, Director, Commercial Intelligence Branch, Central Economic Board, Sudan Government.

Egypt: Mr. G. C. Dudgeon, F.E.S., Consulting Agriculturist, Ministry of Agriculture; Monsieur Victor Mosseri, Member of the Egyptian Institute; Dr. L. H. Gough, Ph.D., F.E.S., Entomologist, Ministry of Agriculture; Mr. B. F. E. Keeling, Director, Physical Service, Survey Department.

France: Monsieur Perrot, representing the Minister for the Colonies.

L'Office Colonial, Paris. — Monsieur Vergnes, Gouverneur des Colonies, Directeur de l'Office Colonial.

Société francaise de Colonisation et d'Agriculture Coloniale.—Dr. Heim, Secrétaire perpétuel de la Société.

Institut Colonial, Marseilles.—Monsieur Baillaud, Secrétaire-General, and Monsieur Stieltjes.

Madagascar: Monsieur Perrot.

French West Africa: Monsieur Prudhomme, Directeur du Jardin Colonial, Nogent-sur-Marne.

French Equatorial Africa: Monsieur Rouget, Sous-Chef de Bureau, Administration Central des Colonies.

Tonkin: Chamber of Commerce, Haiphong.—Monsieur Brousmiche, Vice-President of the Chamber.

Germany: Dr. Bucher, Government Agricultural Inspector, Cameroons.

Deutsche Kolonialgesellschaft, Berlin. — Herr Schultz.

Kolonial Wirtschaftliches Komitee.—Prof. Dr. Warburg, Herr F. Hupfeld and Dr. W. F. Bruck.

Kolonialinstitut, Hamburg.—Professor Dr. Voigt.

Italy: Commendatore Carlo Rossetti, Director of Colonial Studies, Rome.

Dr. Oberto Manetti, Vice-Director, Istituto Agricolo Coloniale Italiano, representing the Minister of the Colonies.

Russia: Mr. B. A. Fedtchenko, Principal Botanist, Imperial Botanical Garden, St. Petersburg.

Austria-Hungary: Museo Commerciale, Trieste.—Professor Giulio Morpurgo.

Netherlands and Netherlands East Indies: Dr. C. J. J. van Hall, Director, Government Institute for Plant Diseases and Cultures, Department of Agriculture, Buitenzorg, Java.

Koloniaal Institut, Amsterdam.—Dr. J. Dekker.

Belgium: Monsieur E. Leplae, Directeur-Général de l'Agriculture, representing the Ministry of the Colonies.

Greece: Monsieur Cosmeto Phoca Cosmetata.

Cuba: Dr. Rafael Martinez Ortiz, Cuban Minister in Paris.

Mexico: Chamber of Agriculture, Yucatan.—Señor don Auguste L. Peon.

Guatemala: Mr. D. Bowman, Vice-Consul in London.

Venezuela: Dr. G. Delgado Palacios.

Siam: Mr. W. A. Graham, Adviser to the Siamese Ministry of Agriculture.

Formosa: Dr. Tokuichi Shiraki, Government Entomologist.

SUMMARY OF PROVISIONAL ARRANGEMENTS FOR THE CONGRESS.

Tuesday, June 23, 10.30 *a.m. to* 6 *p.m.*

Morning.—Meeting of General Committee: General Meeting of the Congress: Reception of Delegates and Representatives; Address by the President. *Afternoon.*—Discussion on "Technical Education in Tropical Agriculture"; Paper on "Work of the British Cotton-Growing Association."

Wednesday, June 24, 10.30 *a.m.* to 6 *p.m.*

Morning.—General Meeting of the Congress: Discussions on "Sanitation and Hygiene on Tropical Estates" and "Legislation against Plant Diseases." *Afternoon.*—Papers on "The Fertility of Soils in the Tropics."

Thursday, June 26, 10.30 *a.m. to* 6 *p.m.*

Morning.—General Meeting of the Congress: Discussion on "The Factors which determine variation in the properties of Plantation Rubber, with special reference to its uses for manufacturing purposes." *Afternoon.*—Papers on "Rubber" (Section 1) and on "Cereals and Sugar" (Section 2); Paper on "The Utilization of Sun Power for irrigation and other purposes in Tropical Agriculture."

Friday, June 26, 10.30 *a.m to* 6 *p.m.*

Morning.—General Meeting of the Congress: Discussions on "Agricultural Credit Banks and Co-operative Societies" and "The Organization of Agricultural Departments in relation to Research." *Afternoon.*—Papers on "Oils and Oil-seeds" (Section 3) and on "Cocoa and Tobacco" (Section 4); Paper on "The Caracul Sheep."

Saturday, June 27, *and Sunday, June* 28.

No sittings of the Congress.

Monday, June 29, 10.30 *a.m. to* 6 *p.m.*

Morning.—General Meeting of the Congress: Discussion on "The Improvement of Cotton Cultivation." *Afternoon.*—Papers on "Cotton" (Section 5) and on "Jute and Hemp Fibres" (Section 6); Paper on "The Fibre Industry of British East Africa."

Tuesday, June 30, 10.30 *a.m. to* 6 *p.m.*

Morning.—General Meeting of the Congress: Papers on "Cotton" (Section 5) and on "Miscellaneous Subjects" (Section 7). *Afternoon.*—Meeting of the General Committee; General Meeting of the International Association; Closing Meeting of Congress.

RECEPTIONS.

Tuesday, June 23, 9.30 *p.m.*—His Majesty's Government will hold a Reception for the Delegates and Members of the Congress at the Imperial Institute.

Wednesday, June 24, 9 *p.m.*—The Royal Colonial Institute will hold a Reception at the Natural History Museum, Cromwell Road, South Kensington, S.W.

The subscription for membership of the Congress is £1. Applications for membership and all correspondence should be addressed to:—

The Honorary Organizing Secretaries,
Third International Congress of Tropical Agriculture,
Imperial Institute,
London, S.W.

VIROL, LIMITED.

Success of the Laboratory Scheme.

THE fourteenth annual general meeting of Virol, Ltd., was held on June 5.

The Chairman, in moving the adoption of the report and accounts, said that the opinion held of Virol in medical circles had been still further raised by the remarkable series of investigations into the action of the white blood cells in destroying disease germs. These investigations proved that the administration of Virol greatly increased the germ-combating power of the blood cells. The scheme for the establishment of the Virol Research Laboratories had been carried into effect. Premises were secured in Bedford Square, and equipped on the most up-to-date lines, with the result that the Virol laboratories were now amongst the finest in the kingdom. Their primary objects were to furnish the medical profession with all possible scientific data in regard to the biochemical and physiological action of Virol in the various conditions of health and disease, and to investigate all scientific questions in connection with the business. They had decided to extend the services of the laboratories to the medical profession for the investigation of clinical questions, and although the laboratories were only opened in March last, public health authorities, hospitals and sanatoria all over the country had availed themselves of the exceptional facilities thus placed at their disposal. They had secured as director of the laboratories the services of Dr. Edward Burnet, who combined with the highest scientific qualifications a very intimate knowledge of the technique and organization of this class of work, and he felt sure that the wide clinical experience and extensive knowledge of Dr. Burnet on all matters relating to public health would prove an important factor in the success of the scheme.

Mr. Arthur E. Canney (Managing Director) seconded the motion, and after a few remarks by Dr. Edward Burnet it was unanimously adopted.

RAT-BITE DISEASE.

OGATA (*Mitteilungen a. d. med. Fakultät d. k. Univ. Tokyo*, April, 1914) considers that a fungus, with which the individual is inoculated when bitten by the rat, is the cause of rat-bite disease. The fungus seems to be of the aspergillus family and to be readily destroyed by mercurial inunctions, improvement and complete cure following on a course of mercurial inunctions.

Personal Notes.

India Office.

From April 18 *to June* 9, 1914.

Arrivals Reported in London.—Colonel H. Hendley, I.M.S.; Lieutenant-Colonel S. E. Prall, I.M.S.; Major H. R. Nutt, I.M.S.; Lieutenant-Colonel C. C. Manifold, I.M.S.; Captain M. F. White, I.M.S.; Captain J. M. Macrae, I.M.S.; Lieutenant Colonel W. Young, I.M.S.; Captain A. J. Lee, I.M.S.; Captain S. T. Crump, I.M.S.; Major S. H. L. Abbott, I.M.S.; Lieutenant-Colonel G. T. Birdwood, I.M.S.; Major R. F. Bard, I.M.S.; Major G. King, I.M.S.; Major E. F. G. Tucker, I.M.S.; Captain A. S. M. Peebles, I.M.S.; Captain W. Tarr, I.M.S.; Lieutenant-Colonel R. Bird, I.M.S.; Major W. W. Clemesha, I.M.S.; Major E. J. O'Meara, I.M.S.; Captain T. L. Bomford, I.M.S.; Captain W. M. Jack, I.M.S.; Major C. W. Melville, I.M.S.; Colonel C. C. Manifold, I.M.S., T.G., Civil Hospital; Major S. P. James, I.M.S.; Captain T. J. C. Evans, I.M.S.; Captain A. C. Anderson, I.M.S.; Captain A. A. McNeight, I.M.S.; Captain F. J. Kolapore, I.M.S.; Captain G. W. Maconachie, I.M.S.; Lieutenant-Colonel V. G. Drake-Brockman, I.M.S.; Captain R. B. S. Sewell, I.M.S.; Lieutenant-Colonel S. Browning Smith, I.M.S.; Lieutenant-Colonel E. A. R. Newman, I.M.S.; Colonel R. Robertson, I.M.S.; Captain G. A. Jolly, I.M.S.

Extensions of Leave.—Lieutenant C. Duer, I.M.S., 6 m.; Major F. O. N. Mell, I.M.S., 10 days; Major D. McCay, I.M.S., 4 m., M.C.; Major J. H. McDonald, I.M.S., 5 m., M.C.; Captain J. B. D. Hunter, I.M.S., 1 m.; Captain R. Brown, I.S.M.D., 4 m., M.C.; Captain G. L. C. Little, I.M.S., 4 m., M.C.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department and the Period for, and Date from, which the Leave was granted.

Abbott, Major S. H. L., I.M.S., Punjab.
Baird, Major R., I.M.S., U.P.
Bennett, Lieutenant-Colonel V. B., I.M.S., Hyderabad, 12 m., March 18, 1914.
Birdwood, Lieutenant-Colonel G. T., I.M.S.
Crump, Captain S. T., I.M.S., Burma Medl.
Duer, Lieutenant-Colonel C., I.M.S., Home Department, India, 30 m., May 1, 1912.
Forrest, Captain J., I.M.S., M., 18 m., February 14, 1914.
King, Major G., I.M.S.
MacLeod, Lieutenant-Colonel J. N., C.I.E., I.M.S., Beloochistan, 10 m., February 5, 1914.
Maconachie, Captain G. W., I.M.S., Ms. Prisons.
Macrae, Captain I. M., I.M.S., Agra Cent. Prison.
Manifold, Colonel C. C., I.M.S., U.P.
Nutt, Major H. R., I.M.S., U.P.
Prall, Lieutenant-Colonel, S. E., I.M.S., Bo. Med.
Singh, Lieutenant-Colonel B. J., I.M.S., B. & O., 8 m., March 7, 1914.
Tarr, Captain W., I.M.S., C.P.
Tucker, Major E. F. G., I.M.S., Bo
Young, Lieutenant-Colonel W., I.M.S., U.P.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Anderson, Captain A. C., I.M.S., to December 2, 1914.
Drake-Brockman, Lieutenant-Colonel V. G., I.M.S.
Evans, Captain T. J. C., I.M.S., to April 12, 1915.
Fleming, Major J. K. S., I.M.S., to November 11, 1914.
Hendley, Colonel H., I.M.S.
Kolapore, Captain F. J., I.M.S.
Lee, Captain A. J., I.M.S.
Manifold, Colonel C. C., I.M.S., to October 18, 1914.
McNeight, Captain A. A., I.M.S.
Melville, Major C. W., I.M.S.
Pearce, Major C. R., I.M.S., to June 15, 1914.
Pridham, Captain A. S., I.M.S., to July 5, 1914.
Sewell, Captain R. B. S., I.M.S.
Seymour, Captain C. G., I.M.S., to December 16, 1914.
Thomson, Lieutenant-Colonel G. S., I.M.S.
White, Captain M. F., I.M.S.

Original Communications.

THE TREATMENT OF YAWS AND THEIR SEQUELÆ BY MEANS OF SALVARSAN.

By Dr. E. C. Girling.

Bolobo, Belgian Congo.

It is, I believe, generally admitted that the treatment of yaws before the introduction of salvarsan was very unsatisfactory. Here at Bolobo our efforts were very seldom followed by any marked degree of success. The treatment was tedious and often painful, and there could be no certainty as to prognosis. Natives of this part of Africa are impatient, and will not usually submit to a prolonged treatment for any disease.

Salvarsan, however, has revolutionized the whole question of the treatment of yaws, and it can undoubtedly be looked upon as a specific remedy for the disease. We have treated actually about fifty patients in various stages of the disease, and in every case recovery has been rapid and complete.

We usually give an intravenous injection of 0·01 grm. of salvarsan per kilo body weight of the patient. We have been successful lately with a much smaller dose, viz., 0·075 grm. per kilo. In small children the intravenous injection is sometimes difficult, and the drug is injected into the muscles of the gluteal region. One injection has, up to the present, proved sufficient. We have had no deaths from these injections for yaws.

The patients experience relief from the pain and discomfort of the disease within forty-eight hours, and the eruption is dry within a week, and has disappeared by the end of fifteen days.

Some of the patients treated had been suffering for more than a year. Four were treated for crab yaws on the soles of the feet; all these four were adults, and their crab yaws had persisted for a number of years. Two of these had received intermittent treatment here for their condition for four years without any permanently good result. All four recovered after one injection of salvarsan, but the recovery occupied a longer period of time.

Two patients were especially interesting in relation to the persistent nature of some of the sequelæ of yaws. As the two cases were very similar, I will only cite one.

M., a lad, aged about 16, presented himself for treatment in 1908. He stated that about five or six years previously he had been infected with yaws. The typical eruption had disappeared, but there remained large granulomatous ulcers on the forehead, occiput, and on the backs of the hands. He was treated with simple antiseptic dressings and iodide of potassium, mercury and arsenic internally. The ulcers healed but constantly recurred. We employed him in the hospital and continued the treatment assiduously for four years without establishing a permanent cure. He also received 24 injections of atoxyl and 10 injections of tartar emetic (corresponding to 8 grm. atoxyl and 1 grm. tartar emetic in all). All our efforts were without avail. In December, 1912, he still had two large ulcers over his occiput and an ulcer on the back of his hand. He then received 0·50 grm. of salvarsan intravenously, and in three weeks he had completely recovered, and he has had no recurrence since. The improvement in his general health has been wonderful. It is of course difficult to exclude syphilis in this case, but one would have expected an improvement from the iodide and mercury he received had it been a simple case of tertiary syphilis. No Wassermann's reaction was done.

A BRIEF NOTE ON AMŒBIC DERMATITIS.

By Lim Boon Keng, M.B., C.M.Edin.

Singapore.

Dermatitis caused by Growth of Amœbæ in the Tissues of the Skin.

Characters.—It begins as minute papules, red and hard, discrete and very suggestive of variola, but there is no fever. A clear fluid appears in a day or two. The vesicles may attain the size of a small pea. The discharge is a serum which forms a crust like that of vaccinia. Each papule ultimately breaks down and then may heal up or leave a depressed ulcer. Rarely the parasites spread widely and cause diffuse spreading erythema with pus in the subcutaneous tissues. When opened, the fresh pus may show white thick creamy pus, which contains large granular amœbæ, closely resembling the *Entamœba histolytica*. The skin around the healed ulcers may become deeply pigmented. The Chinese of Swatow recognize the papular form as the "black blotch" or bleb (= 0-pha). The ulcers are depressed. They may present a smooth cut surface or may be covered with a yellowish-white exudate. The surrounding skin is thickened and red. The ulcer enlarges or tends to heal. The disease is very itchy and contagious, but tends to heal itself, and spreads to a new site. Amœbæ are generally found in the stools. Patients may or may not have had dysentery. In the majority of cases the disease first appeared in the vicinity of the anus.

Situation.—It may occur anywhere, but mainly in the buttocks, and spreads hence to the back, the limbs, face and trunk; no site seems exempt.

Complications.—If extensive, blood poisoning may be the result. Abscesses, cachexia, and renal complications have resulted from extension of the disease. The discharges appear to be singularly free from micro-organisms except the amœbæ.

The Parasite.—From fresh papules, only small amœbæ with fine granules may be seen, but from the large sinuses, large amœbæ with conspicuous granules, vacuoles, and amœboid movement are easily seen; these appear indistinguishable from the *Entamœba histolytica*. The parasite is never seen destroyed by phagocytosis in a progressive case; but after the injection of emetine chloride, the amœbæ can be seen degenerating amidst the agglomerated

masses of the leucocytes. After a week of repeated injections with emetine parasites disappeared from the discharges in a very severe case, where the sinus extended from the lumbo-sacral region to the neck, on the dorsum of the body.

Treatment.—Injections of emetine chloride hypodermically are required in extensive invasions of the skin and subcutaneous tissues. Superficial ulcers may be treated by ung. hydrarg. ammon. and ung. sulphuris. The usual antiseptic remedies may also be tried, but the above are the best. For the complications, appropriate treatment for each condition is required

BRONCHIAL SPIROCHÆTOSIS.

By Frank S. Harper, W.A.M.S.
Tamale, Northern Territories, Gold Coast, West Africa.

T., A COOK in the service of a European Government official, aged about 35, Fantee, came to the dispensary, Tamale, Northern Territories, Gold Coast.

He complained of cough, wasting, profuse expectoration which had never been blood-stained, and had been ill about six months.

Physical examination revealed no prominent physical signs in the chest. There were no râles, rhonchi or crepitations to be heard, there was no dulness on percussion anywhere but I noticed that the vocal resonance was markedly increased all over the chest. There was in addition a very marked enlargement of the lymphatic glands in both triangles on both sides of the neck, in the region of the suprasternal notch, and in both axillæ. The glands were nearly all as big as walnuts, and were not tender on pressure but seemed somewhat soft in consistence. The patient informed me that he had had a gland in the region of the cricothyroid membrane incised for symptoms of suppuration six months before and that the wound had never healed. Neither the liver or spleen were enlarged, and the heart was normal.

I procured a specimen of the gland juice from the axilla. It was easily obtained, was clear, non-purulent and watery in appearance. I could see no organisms I could identify in a specimen stained with methylene blue. The sputum was very similar to the gland juice in appearance, was very thin and watery, contained very little mucus, a very few pus cells, and was extremely profuse. A specimen stained with methylene blue showed numerous spirochætes. These were very thin and delicate, and were of the commonest type mentioned by Castellani and Chalmers in their book on tropical diseases. I could only identify one species.

Examination of the blood revealed only such condition as would be found in a case of moderately severe anæmia. The patient had no temperature the only time he presented himself for examination.

In my opinion this was certainly a case of chronic bronchial spirochætosis which had followed an acute attack.

I very much regret having to publish this case with such insufficient clinical data, but I could not induce the patient to enter the local hospital, as he wished to continue his journey with his master who was going home on leave.

I believe that this is the first case of this condition reported from West Africa.

CANINE BABESIASIS IN PORTO RICO.

By Dr. I. Gonzalez Martínez.

Dr. I. Gonzalez Martinez writes under date of February 28, 1914, announcing the important discovery of *Canine Babesiasis* (piroplasmosis) in the course of routine examinations of dogs for epizootic diseases and for hydrophobia.

The disease was suspected in several cases. In two instances the diagnosis was confirmed microscopically with Leishman's stain, which showed "the characteristic pair of schizonts of *Babesia* or *Piroplasma canis* within the red corpuscles." With Giemsa's stain diluted with distilled water, in the same proportion as is employed to stain the *Treponema pallidum*; and thanks to this procedure beautiful preparations were obtained in which the parasite appeared pyriform, as a rule, with the cytoplasm stained a sky blue and the trophonucleus red. There was also visible in all of them without exception a large vacuole, and in the greater number of cases occupying the same corpuscle were two schizonts, united at their thinner extremities by a slender filament. In other fields could be seen three, and sometimes four, schizonts in the same erythrocyte. On one occasion two schizonts were observed within the protoplasm of a large mononuclear cell.

The schizonts encountered in the examination of the smears of blood obtained from the liver and spleen were larger than those found in the peripheral circulation, nearly all of them measuring close to four microns long.

This is an interesting observation, showing the wide distribution of Babesiasis.

New Preparation.

SECWA is a new departure just brought out by Messrs. Casein, Ltd., Battersea, and is the last word in dry milk products. It contains a larger percentage of soluble whey albumins than any other known preparation on the market, and is to be thoroughly recommended as useful for ailing infants, convalescents from dysentery, enteric fever and other intestinal diseases. It is also of much service to the aged and debilitated, when ordinary foods cannot be assimilated.

Secwa, which is literally dry curds and whey, contains all the ingredients of fresh milk, except the casein and the fat, and is one of the most valuable by-products of milk. The medical profession can prescribe it for their patients with every confidence.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 1, 1914.

INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.

THE important Congress which assembled at the Imperial Institute, London, on June 28, 1914, and continued its work until the 30th, had many important subjects to consider.

Apart altogether from the direct questions of the cultivation of the soil, the production of rubber, afforestation, and the more commercial aspects of agriculture there were many "side" issues which, however, are entitled to be regarded as not only important, but perhaps the basis of all future tropical ventures where the production of the soil is concerned. The greatest of these, the "Hygiene of Tropical Estates," was early brought forward and, on the suggestion of Sir Ronald Ross, who occupied the chair at the time, the whole question of sanitation and hygiene in tropical estates was referred to a standing committee.

Sir Sydney Olivier followed this up by a pointed reference to the direct bearing this subject had upon the supply of labour in the Tropics. The physical efficiency of the labourer has directly to do with the price of food: for when sickness prevails in districts where the population is sparse, sufficient labour cannot be obtained, and the various harvests are ungathered; but even where labourers are plentiful the enormous numbers that have to be engaged owing to wastage from sickness detracts from the commercial resources of the employer and may wreck his finances.

Short of actual sickness there is moreover the physical deterioration of the population, a factor which implies inability of the men to perform a fair day's work, and entails the engagement of an additional amount of labour which thwarts success perhaps even more effectually than acute illness. The explanation of the apathetic disposition of tropical natives of the working classes, so frequently ascribed to their down-trodden condition under tyrannical rulers, is rather to be sought for in their physical inefficiency due to hereditary, or early acquired, diseases. To this cause may be assigned also the use of the lash in times gone by, when "lazy" labourers, anæmic and easily fatigued, failed to please their masters or overseers.

Malaria is, of course, the greatest of these scourges, and were that disease alone eliminated or even lessened, the Tropics would lose their evil name as a hotbed of disease, and the value of the land and all upon it would be enhanced tenfold. That this day will come is assured; when it will come depends on the education of Governments, of masters and employers, and perhaps most of all of the labourers themselves. Malaria immunity is a matter of protection merely, and theoretically anyone who becomes infected has only himself to blame. Individual protection is difficult owing to personal carelessness, and to the dread of derision of one's neighbours at the precautions taken; but protection of the community is a different matter. Drainage is the only real remedy; until the swamps are ditched and channelled, the reedy river shallows cleared, paddy fields removed to a safe distance from the dwellings, malaria will prevail. This must be done by the European; the task is too great for the anæmic and malaria infected native; disease has the upper hand and he has not the strength to rise against it. Remove the cause and he will gain energy and strength to keep the scourge in check in future. The task is Herculean, but not impossible; by teaching practical hygiene to the people, and by insisting on its laws being obeyed the miracle of delivery can alone be performed. The question of the best place at which to establish a school of tropical agriculture was frequently brought up at the Congress. From what one gathers this is

a question which the advisers of the British Government have inquired into, and perhaps settled the matter. Ceylon is put forward as the most convenient spot to locate the school, and this is due as much to the geographical situation of Ceylon as to the flora of the country. Placed on the high road of the eastern seas it is readily reached from India, China, and the Malay Peninsula, East Africa and the great group of islands of the Archipelago.

A twelve months' course is spoken of, but this must be altogether inadequate if serious work is to be done. A fairly good knowledge of entomology, chemistry and bacteriology, in addition to a scientific and accurate acquaintance with botany in all its branches cannot be acquired in twelve months unless the pupil has had previous teaching in these subjects. A preliminary test examination before entering the school in subjects appertaining to the matter in hand will be a necessity, otherwise the pupils will be turned out with a smattering of knowledge merely. Young men can be trained in this country before joining the School. An agricultural college curriculum should be attended in this country before the young men proceed to Ceylon. Just as tropical medicine is but a branch of general medicine so is tropical agriculture but a branch of general agriculture; the pupils in each case must have a general training before proceeding to specialize. A candidate, before going from this country, ought to satisfy a board of examiners that he is fitted to fully benefit by taking out the Ceylon course of instruction. We hope to see this College of Tropical Agriculture speedily established in Ceylon, and it is to be hoped that the agricultural service will be dealt with scientifically, that the students allowed to enter are not the fools of the family who are no good but to "learn farming," and so are sent thither to give them something to do.

Dr. Harford's advocacy of the suppression of the sale of alcohol to natives is also a hygienic measure of deep import to the welfare of labourers in the Tropics, but as yet neither the imperial nor the local government have legislated in the matter.

Amongst the important papers and discussions held at the International Congress of Tropical Agriculture were:—

Discussion on "Technical Education in Tropical Agriculture."

Paper on "Work of the British Cotton-growing Association."

Discussions on "Sanitation and Hygiene on Tropical Estates" and "Legislation against Plant Diseases."

Papers on "The Fertility of Soils in the Tropics."

Discussion on "The Properties of Plantation Rubber, with Special Reference to its Uses for Manufacturing Purposes."

Papers on "Rubber," "Cereals and Sugar," and "The Utilization of Sun Power for Irrigation and other Purposes in Tropical Agriculture."

Discussions on "Agricultural Credit Banks and Co-operative Societies" and "The Organization of Agricultural Departments in relation to Research.

Papers on "Oils and Oil-seeds," "Cocoa and Tobacco," "The Karakul Sheep."

Discussion on "The Improvement of Cotton Cultivation."

Papers on "Cotton," "Jute and Hemp Fibres," and "The Fibre Industry of British East Africa."

Chamberlain Portraits Unveiled.

To commemorate the distinguished services of Mr. Joseph Chamberlain and Mr. Austen Chamberlain to the London School of Tropical Medicine, bronze portrait reliefs of the two statesmen have been placed in one of the wards of the Seamen's Hospital at the Royal Albert Docks, the headquarters of the School. The ceremony of unveiling was performed on June 23 last by Mr. Lewis Harcourt, M.P., Secretary of State for the Colonies. Mr. Joseph Chamberlain was precluded by the state of his health from attending, but Mrs. Joseph Chamberlain and Mr. Austen Chamberlain were present. Among others at the ceremony were Mrs. Lewis Harcourt, Mrs. Austen Chamberlain, Mrs. Endicott, Sir John Anderson, Sir David and Lady Bruce, Sir William and Lady Bennett, Sir M. M. Bhownaggree, Sir Henry Burdett, Sir George and Lady Dashwood, Sir George Denton, Sir James K. Fowler, Sir Thomas and Lady Holderness, Sir Frederick and Lady Lugard, Sir Francis and Lady Lovell, Sir Thomas and Lady Robinson, Sir Reginald and Lady Talbot, Sir William and Lady Treacher, Major and Mrs. H. Bryan, Dr. C. J. Martin, Surgeon-General and Mrs. Godfrey, Dr. Ronald Brinton, Mr. H. J. Read, Professor W. J. Simpson, Dr. and Miss Sandwith, Mr. and Mrs. James Cantlie, Professor R. T. Hewlett, Dr. and Mrs. Low, Dr. C. W. Daniels, Dr. H. B. Newham, Dr. and Mrs. Bahr, Dr. F. W. O'Connor, Dr. Lynch Burgess, and Mr. Perceval A. Nairne, Chairman of the Seamen's Hospital Society and of the London School of Tropical Medicine.

Mr. Perceval Nairne explained that the President, Admiral Prince Louis of Battenberg, who took the deepest interest in the institution, was unable to be present owing to his having to fulfil a long-standing official engagement.

Colonial Secretary's Appreciation.

Mr. Lewis Harcourt, M.P., said that he deemed it a distinguished honour to be permitted to perform the ceremony. He owed this, of course, in the first place, to his official position, but he hoped he might confidently attribute it in some degree also to his life-long friendship with Mr. Chamberlain. Political differences occupied their proper, but not, he hoped, exaggerated, place in public life, but they never had, and never could, blind him to the great services rendered in other spheres by those to whom he might happen to be politically opposed. It was pleasant to meet on the neutral and illuminating territory of applied research. Seldom could it have happened to two men—father and son—to have their great services jointly recorded, and, happily, in the lifetime of both, and never was an honour more abundantly deserved. During his eight years' tenure of the office

of Colonial Secretary, Mr. Chamberlain became painfully aware how great a factor in Imperial administration were the problems and the prevalence of tropical disease. Had he been present on this occasion, Mr. Chamberlain would, he was sure, have been the first to acknowledge that the initiation of a School of Tropical Medicine in connection with this Hospital was largely due to the conception and foresight of Sir Patrick Manson. Many men owed their lives, and many millions of mosquitoes their deaths, to Sir Patrick's suggestive and alleviating discoveries. It was now fifteen years since Mr. Chamberlain, realizing the necessity for further openings for research, observation, and treatment, suggested the institution of a new School of Tropical Medicine in association with this branch of the Seamen's Hospital. The reasons for his selection were obvious; its contiguity to the docks and Port of London rendered it a frequent resting-place for many of those who had contracted, and not recovered from, those very diseases which it was desired to destroy. It was one thing, and an easy one, to suggest a school: it was quite another to endow it. With characteristic energy Mr. Chamberlain did both. In May, 1899, he raised at a banquet a sum of £15,000, and by October of the same year laboratories had been built and the School opened.





F. W. Doyle-Jones, Sculptor.

SEAMEN'S HOSPITAL SOCIETY.

Bronze Portrait Reliefs erected in the Albert Dock Hospital to commemorate the services rendered by the Rt. Hon. Joseph Chamberlain, M.P., and the Rt. Hon. Austen Chamberlain, M.P., to this Hospital and to the London School of Tropical Medicine, 1914.

This success became almost an embarrassment, for six years later more accommodation became imperative, and at a second banquet Mr. Chamberlain raised a further sum of £10,000. This equipped a library, a museum, and special tropical wards, which brought the number of beds up to fifty. The total capital expenditure up to date had amounted to £50,000, and the annual expenditure was £3,000, which latter amount was, however, nearly met by the students' fees. Grants, not ungenerous in amount, had been made by the Treasury and other public departments, and an annual contribution of £850 was made by the Crown Colonies as a token of their gratitude for the advantages they enjoyed from the institution, while many private benefactors had added to its funds. Experimental work was done in the laboratories, and the students had spread themselves over half the habitable globe in pursuit of further knowledge. Malaria, sleeping sickness, guinea worm, sprue, dysentery, and ankylostomiasis had each in their turn been subjects of their inquiries. Nothing had been more remarkable in the modern progress of medical science than the great and sometimes unexpected results which had accrued from the meticulous industry of individuals in apparently objectless record and investigation. The microscopic application in the dissection of facts and the observation of phenomena brought into a creative focus by such schools as this materially served the health and happiness of humanity. The number of students had grown steadily from 70 in the first year to nearly 200 in the last. The number who had passed through the School was now close on 1,800, and he was glad to say that nearly 700 of these had entered the Colonial Medical Service. It was only those at the centre, like himself, with the vital statistics of the Colonial Service always before them, who could appreciate what those men had done to ease the pain and modify the dangers of tropical life. The West Coast of Africa, once regarded as a death-trap, would soon be looked upon as a sanatorium. During the period to which he had referred, the death-rate among British officials had been reduced from 28 per 1,000 to 8 per 1,000, and the invaliding rate from 62 to 28. Mr. Joseph Chamberlain, speaking fifteen years ago, said: "The man who shall make the Tropics livable for white men, who shall reduce the risk of disease to something like an ordinary average, will do more for the world and more for the British Empire than he who adds a new province to the wide dominion of the Queen. All those who co-operate in securing this result, whether by their personal service or by some pecuniary sacrifice, will be entitled to share the honour and to add their names to the golden record of the benefactors of mankind." On that record there was no doubt that both father and son were entitled to have their names recorded. In recognition of their splendid services he would presently proceed to unveil the medallions.

Mr. AUSTEN CHAMBERLAIN, who was loudly cheered, said that he felt deeply embarrassed to find words to thank Mr. Nairne and the Committee of the Seamen's Hospital for the kindly thought which had

led them to suggest this memorial, and Mr. Harcourt for the very kind words in which that gentleman had spoken of the services of his father and himself. To tell the truth, he felt that he himself in this matter was nothing but an accident, though he hoped a happy one. His father entered on his term of office as Colonial Secretary with a double programme of work, one part of which was to do all that in him lay to bring closer together the self-governing Dominions of the Empire, and the other to promote the undeveloped resources of the tropical and semi-tropical Dependencies and Crown Colonies of the Empire. The first step towards their development, it seemed to him, would lie in an improvement in the health of their white administrators because such improvement would give greater attractions to their life, more people would take it up, and progress would be more rapid. The improvement in the health of the whites was necessarily linked with consideration for the health of the native inhabitants, who, though they were not to the same extent victims of many of the diseases that were fatal to white men, yet had their own peculiar troubles, for which peculiar remedies were needed.

Very early in his career at the Colonial Office his father ascertained that the man who could best advise him and co-operate in combating tropical diseases was Sir Patrick Manson. Sir Patrick had felt the need of such an institution as this; in fact, he had suffered from that need, and the suggestion for its foundation came from him. No sooner was the proposal set forth than the late Sir Alfred Jones set about founding the Liverpool School of Tropical Medicine. The Liverpool and London Schools, therefore, came into existence almost simultaneously, and since then they had worked in perfect amity or with a rivalry that had never been anything but healthy and friendly. Already they had done much, and it was apparent that they could do infinitely more. To his father and to Sir Patrick Manson, then, the institution owed a great deal. He himself was brought in much later in the day, when the present Colonial Secretary invited him to accept the Chairmanship of the Committee. Such an invitation he could not decline, and he had done all he could to make the undertaking a success. In this connection he would like to say a word of acknowledgment with regard to the great assistance he had had from the Committee of the Seamen's Hospital, and its Secretary, Mr. Michelli; from Mr. Read, of the Colonial Office; and from the Committee which had been formed in the City of London under the auspices of the London Chamber of Commerce, as well as others in the City of London who were interested in tropical and semi-tropical countries. For himself, he could only say that he humbly accepted his share of the honour done to his father and himself. He most heartily thanked them for having recorded on the walls of that Hospital the association of his father with a work in which he had taken and still took a deep interest.

The Colonial Secretary unveiled the memorial, which is by Mr. F. W. Doyle Jones, and represents the two statesmen facing each other.

Annotations.

Helminthemesis (A. R. Neligan, *Lancet*, June 6, 1914.)—Every Persian is infected at one time or another in the course of his life, and a large proportion of Europeans fail to escape. The common worms in the North of Persia in the order of frequency are *Ascaris lumbricoides*, *Oxyuris vermicularis*, and *Tænia saginata*.

Vomiting of a round worm is very often accompanied by serious general disturbance. The first case of grave illness to which I was called after arriving in Tehran was that of a child aged 4 who was unconscious, with high fever, a rapid irregular pulse, and Cheyne-Stokes breathing. Meningitis was my diagnosis, but within twenty-four hours the child vomited a round worm and promptly got well. Cases of obscure and apparently grave illness, both in adults and children, terminate by the vomiting of a worm; I should say round worm, for I have never seen a tapeworm expelled from the mouth. To omit to give santonin in most cases of gastro-intestinal disturbance, and to many patients whose symptoms cannot be correlated with any definite diagnosis, might in Tehran almost be dubbed malpraxis!

A case of helminthiasis the like of which I have not read of nor seen again, was a child aged 7, wasted to skin and bone, face drawn with pain, fever, irregular bowels, and occasional vomiting. Abdomen full of lumps, some as big as hen's eggs, and tender. Diagnosis: tuberculous peritonitis. Prognosis: hopeless. Treatment: calomel and santonin in small doses, as a beginning. In three days the child was brought back looking a different creature and the lumps in the abdomen gone; scores of round worms must have been expelled.

THE ROYAL INSTITUTE OF PUBLIC HEALTH. EDINBURGH CONGRESS.

Wednesday, July 15, to Monday, July 20, inclusive.

The papers to be read at this Congress bearing upon tropical medicine are:—

(1) The Treatment of Trypanosoma Diseases with Antimony Preparations, especially with Irixidin: By Professor W. Kolle, M.D., Berne.

(2) The Control of Rat Plague: By W. E. Harker, M.D. and Major R. W. Jackson, M.D.

(3) The Decline of Enteric amongst British Troops in India: By Lieutenant-Colonel N. Faichnie, R.A.M.C.

(4) Some effects of Damp Heat: By Surgeon D. A. Mitchell, R.N.

(5) The Struggle against Mosquitoes: By Surgeon D. H. C. Given, R.N.

(6) Sanitary Progress in British Guiana: By K. S. Wise, M.B., B.S.

The Congress Secretary's office is at 45, Queen Street, Edinburgh, until the opening of the Congress. After the opening the Secretary's office will be in the University.

Abstracts.

NOTE ON A CASE OF DEATH FOLLOWING THE STING OF A SCORPION.*

By R. McC. Linnell, L.R.C.P.

The patient, a coolie, aged 20, was admitted to hospital, Kuala Lumpur, on January 25, 1914. He had been working regularly until two days previously, when he was stung by a scorpion in the left heel. For the cure of the sting the other coolies had made him eat the head of the scorpion. On admission to hospital the patient complained of "things creeping all over the body." The temperature was 102·8° F. No malarial parasites were found. A blood count gave the following percentages: polymorphonuclears, 75·8; mononuclears, 0·81; lymphocytes, 9·68; transitionals, 5·64; mast cells, 0·81; and eosinophiles, 7·26; The heart and lungs were clear and the urine was normal, but the fæces contained ankylostoma ova. On the fourth day after receiving the sting the patient had paralysis of the legs, and on the fifth day motor paralysis to the umbilicus, sensation being unaltered. On the sixth day there was retention of urine, and on the ninth day sugar was present in the urine (between the third and ninth days the urine was not examined). On the thirteenth day the patient became comatose, but could be roused to eat and drink. The temperature on the following day fell below 95° F., and the patient was still comatose. Death intervened on the fifteenth day.

The patient had seemed to be able to feel as long as he was conscious. The sugar had persisted in the urine from the ninth day to the end. The patient's relatives had very strong objections to a *post-mortem* examination being held, but I finally persuaded them to allow me to remove a piece of the spinal cord. Dr. W. Fletcher, Pathologist to the Institute of Medical Research, Kuala Lumpur, kindly examined this and reported as follows:—

"A portion of the lumbar cord was received for examination. It had been hardened in alcohol, so that no pathological changes could be recognized in the myelin sheaths. Paraffin sections stained with Heidenhain showed that the cord was affected with acute disseminated myelitis. In one part there was acute destruction of the anterior horn and an infiltration of round cells. In another portion Clarke's column had been destroyed. The perivascular sheaths were crowded with small round cells and the meninges were congested. Some of the cells of the anterior horn were swollen and the nuclei eccentric; chromatolysis had occurred in many of them."

Although scorpion stings are fairly common in the Federated Malay States, yet deaths following them directly must be extremely rare, the above case being the only one which I can trace. The scorpion was a small brown specimen, which the natives declare to be the most vicious and deadly of all. What appears to be an unusual feature in the case was the appearance of sugar in the urine.

* *Lancet*, June 6, 1914.

TWO CASES OF SPRUE TREATED BY MOUTH STREPTOCOCCAL VACCINES AND EMETINE HYDROCHLORIDE HYPODERMICALLY.*

By Leonard Rogers.

Case 1.—A Mohammedan woman, aged about 40, in October, 1905, had commenced passing a number of large light-coloured loose, frothy stools, said to be as many as twenty daily, and accompanied by obstinate dyspepsia. She was then a stout woman weighing 14 st., but her weight soon became reduced to 10 st. During the following year the diarrhœa was less, with only about five stools daily, but she was never free from it. In November, 1908, there was a recrudescence, with numerous loose stools, nausea, and flatulence. She stated that this condition had continued ever since, and that for nine years she had never been free from diarrhœa, although she had been treated by a number of medical men, both European and Indian, in Bombay and Calcutta. She lived in Bombay from June, 1911, to December, 1913, but was worse there than when in Calcutta. At that time she used occasionally to become giddy and even faint, having several times been found collapsed on the floor at night on her way back from the bathroom. During the eighteen months she was in Bombay her gums were ulcerated and they bled freely, and she was told by a dentist that this condition could not be cured until all her teeth had been removed, which she declined to allow.

Present Condition.—When first seen, on December 6, 1913, she was passing about twelve large, loose, pale, sprue-like stools daily, accompanied by flatulent dyspepsia. I failed to find any amœbæ in the stools. There was marked pyorrhœa alveolaris, so I made cultures, and obtained large numbers of streptococci, from which a vaccine was made.

Progress.—Half-grain doses of emetine hydrochloride were injected hypodermically every other day, and were soon increased to 1 gr. doses. After two or three injections, and before the vaccine had been commenced, the stools became much less frequent and of better consistency and colour. After eight injections the evacuations had become healthy and only one or two a day. In the meantime the streptococcal vaccine was begun, 50,000,000, soon increased to 100,000,000, being injected once a week. The discharge of pus from the gums rapidly decreased, and in a few weeks completely disappeared, and has remained absent for the last four months. No teeth were removed. Some superficial soreness and redness of the tongue subsequently appeared, from which a streptococcus was also cultivated. A vaccine made from this removed the unhealthy condition of the tongue within a few days.

On May 3 last, except for slight redness of the tip of the tongue, she was quite well; almost five months since the diarrhœa ceased, after having been continuously present for nine years before the new treatment was commenced. She has no dyspeptic symptoms, and can digest all ordinary food. She is

* *Lancet*, June 6, 1914.

now free from the giddiness, faintness, and neuralgia which she used to suffer from, and her general health has greatly improved. She has not been weighed regularly, but has put on some flesh and has gained much in strength. The only trouble with her bowels is a slight tendency to constipation, necessitating an occasional dose of castor oil.

CASE 2.—A woman, aged about 40, had had very severe diarrhœa in Calcutta, in August, 1909. She had also been treated twice in England, twice in Hong Kong, in Berlin, as well as making two voyages to Japan. On December 17, 1913, she was in a very emaciated and weak condition, and passing several large, pale, typical sprue stools daily. Emetine hydrochloride was given in ½ gr. doses two or three times a week, and later increased to 1 gr. doses. She slowly improved during the next three weeks, but on January 14 last she had a severe relapse with frequent copious stools. Her mouth had now become very painful, with numerous small shallow ulcers on the tongue and buccal mucous membrane, while the temperature rose every afternoon for about a week. She was very prostrated and too weak to stand or even sit up, while the pulse was fast and irregular. Cultures from the mouth ulcers showed in some tubes a pure growth of a streptococcus. I therefore made a vaccine from it and commenced with 50,000,000, increased later to 100,000,000, once a week. After the second dose of the vaccine both the mouth and the bowel symptoms rapidly improved. Towards the end of January she was put on a milk diet, beginning with 6 oz. and gradually increasing it to 120 oz. daily by the end of three weeks. The emetine injections were continued twice a week. The diarrhœa now stopped, the mouth lesions healed, the vaccine being continued once a week. Up to this time the patient was being carried from her bed to a couch for a few hours daily. She now rapidly improved, and on March 4 was able to be moved to Bangalore, a three days' railway journey, for the hot weather.

On March 20, the patient reported that she had had no signs of diarrhœa since February 5. The mouth was quite well. She had gained just over a stone in weight in four weeks, before which she had become reduced to 6 st. 9 lb., or to under half her original weight. She was now able to walk a quarter of a mile and do everything for herself. She was continuing the vaccine once every eight days and the emetine injections once in ten days. On April 9, she reported continued improvement. She could now digest eggs, semolina, and toast and butter. When I last heard from her, on April 28, she remained free from all signs of sprue and continued to gain weight steadily.

The success attending the use of a vaccine made from the streptococci which were found present in practically pure culture in the mouth lesions is very significant, and opens up the interesting and suggestive question as to whether this class of organism may not be the cause of the disease, at least in some cases. The rapidity with which the disappearance of mouth ulcers under the influence of the vaccine was in the second case followed by cessation of the diarrhœa certainly suggests a causal relationship between the organism and the disease, and affords some hope of the new treatment proving to be of a specific nature and thus an important advance in dealing with this intractable and distressing disease. Even in cases where no mouth lesions are present there may still be a streptococcal infection of the digestive tract, and possibly cultures may be obtainable from the stools which might prove of service in the form of a vaccine.

NOTE ON A FOREIGN BODY REMOVED FROM THE LIVER AFTER TWENTY-THREE YEARS.*

By SEYMOUR BARLING, M.S., F.R.C.S.

IN September, 1911, a healthy married woman, aged 26, came up to the out-patient department at the General Hospital, Birmingham, complaining of pain shooting down the right side of the abdomen into the groin. The pain was intermittent, had been present on and off for about a year, and was accompanied by some tenderness in the right iliac fossa. Examination of the urine was negative, and a radiograph of the kidney and ureter showed no abnormal shadow. The condition was diagnosed as due to chronic inflammation of the appendix. At the subsequent operation a long appendix, somewhat kinked at its root, was found and removed. This was considered sufficient to account for the patient's symptoms.

The patient again presented herself in October, 1913. She still complained of her old pain, which had been little, if at all, relieved by the operation. It now seemed higher up, near the right costal margin, and was distinctly worse when she was up and about than when lying down. On closely questioning her as to her past history, it was ascertained that twenty-three years ago she was carrying a bottle of beer up some steps when she stumbled and fell, cutting herself just over the lower margin of the chest. She was very ill after this, and was confined to her bed for nearly six months. On examination a scar was found 3 in. long, exactly parallel to the interval between the sixth and seventh costal cartilages on the right side. This had previously been overlooked owing to a pendulous breast.

Another radiograph was taken somewhat higher up than on the former occasion. This revealed an opaque body, about 3 in. by 1 in., lying across the tenth and eleventh ribs just external to the upper end of the right kidney. It had been just missed by the first radiograph, which included the kidney area only.

As a lateral view could not be taken satisfactorily, it was difficult to determine the exact depth of the foreign body. An incision was therefore first made in the subcutaneous and muscular tissues over the lower part of the thorax posteriorly. Nothing, however, could be detected there.

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* From the *Archives of the Roentgen Ray*, June, 1914.

The abdomen was then opened through the right linea semilunaris, just below the costal margin. On introducing the hand into the sub-diaphragmatic space it was found that a large mass of adhesions filled the interval between the under surface of the diaphragm and the right lobe of the liver. Good access was given to this region by cutting through the right rectus muscle. When the adhesions had been broken down a large cyst with whitish fibrous walls was found, partly in the sub-diaphragmatic space and partly in the substance of the liver.

When this was punctured a dark fluid issued, and a freer opening of the cyst yielded something over a pint of this fluid, dark in colour and evidently the residue of an old hæmorrhage. Deep in the cyst were the fibrous remains of an old blood clot, and embedded in this could be felt some sharp-edged foreign body, which cut the gloved finger when endeavours were made to dislodge it. Eventually a piece of thick green bottle glass was removed, measuring 2⅔ in. by 1½ in., triangular in shape. It was curved, and was evidently a portion of an ordinary bottle, the edges and corners being as sharp as those of recently fractured glass.

The cyst was packed with gauze, as the hæmorrhage was somewhat free, and a drainage tube was stitched into the wound. The patient made an excellent recovery, and left hospital in three weeks. There is still a sinus, discharging a slight amount of pus, but this is gradually closing.

The case is of interest as showing the length of time such a dangerous object can lie dormant in a vascular organ like the liver. It also shows the importance of a complete radiographic examination as an aid to diagnosis.

AN INVESTIGATION OF THE CAUSES OF FAILURE IN COW-POX VACCINATION.*

By JOHN NIVISON FORCE, M.D., M.S.

THIS paper is the record of an investigation of the causes of failure in the cow-pox vaccination of persons entering the University of California with no visible evidence of a previous vaccinia. All entrants not showing a vaccination scar were vaccinated. Failure to "take" resulted in a repetition of the vaccination twice during the first term, and once every succeeding term during residence at the University.

Technique.—The arm was scrubbed with soap and sterile water, rinsed with alcohol and dried with cotton.

Scarification was made by means of a chisel with a carbon steel point which could be dipped into alcohol and flamed without affecting the cutting edge.

Application of Virus.—The virus was applied to the scarified spots by means of a sterile wooden toothpick. The amount adhering to a flat-ended toothpick dipped into glycerinated virus was sufficient for the inoculation of the three scarified spots constituting a vaccination.

A gauze square was then applied to the wound and was secured by four strips of adhesive tape. Verbal instructions were given the person regarding the protection of the arm, and return for the renewal of dressings.

The return date (five days after vaccination) was stamped on the adhesive tape. A printed card of instructions regarding the care of the vaccinia replaced the verbal directions formerly given. No antiseptics, salves or shields were used. On the tenth day, when area formation normally occurs, a few persons complained of soreness in the arm. This was much relieved by the application of a compress, kept moist with 50 per cent. alcohol. The inflammation subsided in twenty-four hours. In the absence of large scarified spots there were no "bad" arms.

Area formation on the tenth day is evidence that the growth of the colony of vaccine organisms has been arrested by the antibodies which have been formed by the stimulation due to the organism, or, in other words, that immunity has been established.

The practice of destroying the colony by opening the vesicle and applying phenol (carbolic acid) before area formation occurs naturally results in a reduction of the size of the dose of vaccine organisms. Immediate revaccination in the cases in which the dose has been insufficient would produce a vesicle. Revaccination when a condition of active immunity exists would only result in the reaction of immunity as hereinafter described.

Investigation of Alleged Immunity against Cow-pox.—By attention to the technique and virus, the failures in unscarred persons have been reduced from 21 to 16 per cent. There remains still the question of alleged natural immunity to cow-pox vaccination.

A small-pox epidemic at the opening of the second term of the academic year 1912-1913 gave opportunity of observing the course of revaccination in persons with scars of various kinds who reported for vaccination "to be on the safe side."

The experience gained in over one thousand revaccinations observed at that time confirmed the observations of Jenner,* v. Pirquet and others regarding the difference between a true primary vaccinia and the condition produced by revaccination, which the French authors call "vaccinoid."

In general a vaccinia observed five days after vaccination is characterized by a yellowish vesicle surrounded by a narrow red areola, while the vaccinoid of the same age has a comparatively smaller vesicle surrounded by a wider areola. When no vesicle develops and the areola appears and subsides early we have the immediate reaction of v. Pirquet, which was first described by Jenner as "sudden efflorescence."

The Test of Immunity.—During the course of some observations and measurements of these areolæ of immediate reactions, it occurred to me that this reaction might be used as a test of those failures

* From the *Journal of the American Medical Association*, May 9, 1914.

* Jenner: "An Inquiry into the Causes and Effects of Variolæ vaccinæ, 1798."

which persisted each year in spite of our best efforts with uniform technique and cold virus. In a previous paper some of the characteristic cases were described, but a general application of the test was not made until the opening of the academic year 1913-1914.

Previous to January, 1913, only the unscarred entrants had been vaccinated. Certain changes in the State vaccination law caused the regents of the university to issue an order that, in addition to unscarred entrants, all other entrants showing a scar over seven years old must be vaccinated. This order gave an excellent opportunity for the following application of the test of immunity:—

If a student had an old or otherwise unsatisfactory scar, he was vaccinated in two spots on the arm, a control spot being scarified and rubbed with the glycerine diluent used in the preparation of vaccine. Observations were made at twenty-four, forty-eight and seventy-two-hour periods after vaccination. If either of the vaccinated spots showed an areola of 5 mm. or over (with or without papule) at the end of twenty-four hours, which areola (or papule) had decreased at the time of the seventy-two-hour observation, it was considered a *reaction of immunity* due to the presence in the blood of the individual of antibodies against vaccine virus. The student was excused from further vaccination. If either of the vaccinated spots showed an areola at the end of twenty-four hours which developed into a small vesicle, maturing on the fifth or sixth day and then rapidly subsiding, the reaction was considered a *vaccinoid*.

If there was no change until the third day, and then a small areola began to form, the case would be *vaccinia*. If there was no change by the fifth day, the failure was charged to technique and the experiment was repeated. If a case was not seen until the fifth day, and there were no signs of a recent local reaction, the vaccination was repeated, and daily observations were made, for all signs of the reaction of immunity may be gone by the fifth day.

Results of the Application of the Immunity Test.—Out of 589 persons vaccinated during the semester August-December, 1913, complete records have been obtained from all but two. In all doubtful cases a revaccination has produced one of the characteristic reactions.

(1) Of three previously unvaccinated entrants giving the reaction of immunity, one had a definite history of small-pox, one had a history of recent chicken-pox (which might have been small-pox), and the third denied having had either small-pox or chicken-pox.

(2) Sixteen unscarred old students and ten unscarred entrants gave the reaction of immunity. This would imply the presence of antibodies against vaccine virus, due to repeated doses of a virus in each instance incapable of *growth*, but capable of producing immunity; that is, analogous to a bacterial vaccine made from a killed culture.

(3) The highest percentage of reactions of immunity occurred in persons having well-pitted scars.

(4) No natural immunity against vaccine virus was discovered. Such a person would have no history of vaccinations nor would he give a *specific* reaction of immunity to vaccine virus.

The following cases serve to illustrate certain points which must be considered in the application of the test:—

CASE 1.—G. R., entrant, vaccinated just before entrance with no result, was vaccinated September 22, 1913.

September 26. No reaction.

September 29. Revaccinated with same virus, in two spots with a control scarification.

September 30. No reaction in vaccinated spot.

October 1. No reaction.

January 5, 1914. Revaccinated with fresh virus in two spots with a control scarification.

January 6. No reaction in vaccinated spots.

January 7. Areolæ, 7 mm. in diameter, around vaccinated spots.

January 10. Vesicle in vaccinated spots, but areolæ 20 mm. in diameter in place of the ordinary small areola hardly larger than the vesicle.

CASE 2.—P. A., entrant, never vaccinated, was vaccinated October 1, 1913.

October 6. No reaction.

October 13. Revaccinated with same virus in two spots with a control scarification.

October 14, 15, 16 and 20. No reaction in vaccinated spots.

October 27. Revaccinated with a fresh virus, two spots, and a control scarification.

October 21. No reaction.

November 3. Vesicles on both vaccinated spots, but areolæ larger than normal for primary vaccinia.

These two cases were stragglers vaccinated during the month following the general vaccination of entrants. The repeated vaccinations with an inert virus probably served to sensitize them. This accounts for the large areolæ occurring in conjunction with the formation of vaccinia vesicles.

CASE 3.—L. S. H., old student, vaccinated between ten and twenty years ago. Had scar 15 mm. in diameter very well pitted, the type of scar from which we obtain the highest percentage of immunity reactions. Vaccinated November 19, 1913, in two spots with a control scarification, *the same virus being used which had failed twice with Cases 1 and 2.*

November 20. Areolæ 10 mm. in diameter with slight papule around both vaccinated spots.

November 21. Same condition.

November 25. Areolæ almost faded.

This case shows that virus incapable of growth may produce the reaction of immunity in a person well supplied with antibodies. It is suggested that repeated inoculation with a virus inactivated by heating, or sensitized by serum from an animal immune to vaccinia, might stimulate antibody formation without the necessity of first growing the colony of vaccine organism on the skin as a culture-medium.

If by the fifth day no reaction whatever occurs in a previously unvaccinated person, the virus is probably inert. Signs of activity produced by vaccinating a previously vaccinated person with the same virus should not be considered proof to the contrary. In

the absence of natural immunity, one of the three reactions must occur.

CONCLUSIONS.

(1) Any one of the typical reactions against vaccine virus must be regarded as an evidence of immunity.

(2) If antibodies against virus are present in the blood of the individual the immediate reaction occurs, characterized by the formation of an areola around the vaccinated spot usually within the twenty-four hours succeeding the vaccination.

(3) If antibodies are not present but the power of forming them exists through previous vaccinations, the growing vesicle is aborted sooner than in a previously unvaccinated person, which accounts for the small size of the vesicle and the early appearance of an areola larger than in the case of a vesicle of the same age.

(4) The technique described is an aid to exact observation subsequent to revaccination.

(5) Physicians' certificate of immunity should be based on an observed reaction and not on the failure of two or three vaccinations, unobserved until the i.h day after the insertion. These "failures" may not have been due to immunity but to inert virus.

RESEARCHES IN SPRUE, 1912-1914.*

By P. H. BAHR, M.A., M.D., D.T.M. & H.Cantab.

IN sprue, a disease obviously of an intestinal origin, so chronic in its course, exhibiting such powers of latency, in fact so definite and unsatisfactory a subject for investigation from every point of view, it is not surprising that the conclusions reached from work in Ceylon are somewhat indefinite and unsatisfactory.

It is necessary to refer shortly to the disease known as hill diarrhœa, which has been inextricably confused with sprue. Hill diarrhœa is a flatulent dyspepsia accompanied by nausea and vomiting, and by the passage of large, pale, liquid, and fermenting stools. A distinctive feature of the diarrhœa, apart from the peculiar colour of the stools, is the tendency to be passed in the early morning. The tongue and mouth are never involved. The disease is apt to occur in epidemics, especially in the Indian hill stations. The attack is generally acute, and in the majority of cases promptly subsides on leaving the endemic area for the plains, and is attended by little or no mortality, but in a few instances diarrhœa persists for some time and may develop into genuine sprue. The facts so far known suggest some functional disturbance of the digestive organs as the most probable etiological basis; against this supposition is the fact that since the sanitation and water-supply of the Indian hill stations have been improved, the incidence of hill diarrhœa has apparently decreased.

Sex.—In the thirty-six European cases the majority —nineteen—occurred in females; the especial liability of the female sex to infection is strengthened when it is remembered that the proportion of European males to females in Ceylon is as two to one.

Age.—The oldest man I saw suffering from sprue was a burgher aged 76, the youngest a Eurasian boy aged 13.

THE INFLUENCE OF IMMEDIATE ENVIRONMENT.

Housing.—There is a prevalent and popular idea in Ceylon that sprue most commonly originated in dry-rot bungalows, which are notoriously unhealthy; the dry-rot is a sawdust-like powder which filters from the beams, emitting a disagreeable smell and giving rise to symptoms of pharyngeal and nasal irritation. The evidence seems to negative the suggestion that dry-rot is directly connected with sprue, save that an unhealthy environment of this sort may predispose to its development by reducing the normal vital resistance to the disease.

DISEASES WHICH PREDISPOSE TO SPRUE.

The development of some chronic infection, such as dysentery, is regarded as the most important predisposing factor; some observers have gone so far as to suggest that the condition known as sprue is actually the ultimate result of a chronic dysentery, others that the development in the intestinal canal of the sprue germ is favoured by frequent dysenteric attacks.

Amongst my cases the occurrence of previous dysenteric attacks is noticeable, but it is open to doubt whether this connection is merely incidental, seeing that the majority of residents have, at one time or other, been subject to such attacks. In one half of the cases the disease arose *de novo;* there are ample grounds, therefore, in regarding sprue as a primary specific infection, but that, as in all other chance infections — such as tuberculosis — any debilitating cause may lower the vital resistance and render the alimentary tract more liable to attacks of the specific sprue germ.

SPRUE REGARDED AS AN INFECTIOUS DISEASE.

The occurrence of sprue in Ceylon in all classes of the community, irrespective of age, sex, race, or environment, are facts suggestive of the communicability of the disease from man to man. The contagion theory has already been advanced. In my experience cases of this nature in persons closely associated were far too frequent to be of a purely accidental occurrence. There were six instances of the disease occurring in one or more closely associated members of the same family, such as mother and son, father, sister and daughter, husband and wife, mother and daughter, &c. In the first case quoted there was more or less definite evidence of a direct infection. The mother, a Eurasian, was, while lying very ill, in the habit of feeding her son, a boy aged 13, with her own spoon; a few months before she died the boy developed symptoms. All my attempts to convey the disease directly to the lower animals, rabbits and monkeys, by inoculating

* From the *Transactions*, Society of Tropical Medicine and Hygiene, April, 1914.

scrapings of sprue tongues and by injecting sprue stools into the alimentary canal, failed.

Symptoms of Sprue.

The symptoms of the disease and its manifestations varied so considerably that the only satisfactory classification was one which rested upon the hypothesis that the disease process affects the various regions of the intestinal canal to an unequal degree, and thus gives rise to symptoms according as one or other rogion is specially affected.

Under the heading of "typical or complete sprue" are included all those cases exhibiting the two cardinal symptoms—the characteristic tongue and stools—but even in this category are included cases of all degrees of severity, which I considered myself justified in regarding as mild, acute, and chronic manifestations of the same disease.

Under the heading of "incomplete sprue" are included a number of cases with the typical diarrhœa, but without any affection of the mouth and tongue, and also a large series of diarrhœas, mostly in young male Europeans, accompanied by emaciation, flatulence and dyspepsia, which I regard as early cases of sprue and not as cases of hill diarrhœa as described by Indian authorities. Finally, I include, as a further division of incomplete sprue, under the name of "tongue sprue," cases occurring in all races, in whom the typical tongue and mouth symptoms are present, though the disease process does not appear to have spread beyond the buccal cavity.

Typical or Complete Sprue.—The earliest symptoms varied widely in different patients; in the majority the onset was insidious; in only four cases could I elicit the occurrence of an acute diarrhœa, merging later into a more chronic form. In eleven cases tongue symptoms, in two persisting for three years before the commencement of the diarrhœa, were the only two indications of the onset of sprue.

It is important to notice the absence of any history of the occurrence of buccal aphthæ in four cases, two of which were seen daily during the terminal stages of their illness.

In advanced stages of the disease, in which there was also marked anæmia, curious pigmentations of the skin, consisting of brown patches of irregular outline, were present, and were situated on the forehead, temples, cheek, on the abdomen, and once on the legs. Apparently this pigmentation is associated with the anæmia, as the patches disappeared on treatment and directly an improvement in the general condition of the patient set in.

Incomplete Sprue.—In seven cases, four in men and three in women, the stools were typical, but in no single instance could any abnormal appearance of the tongue be detected. In one patient these symptoms had persisted for twelve years. Twenty-one cases had chronic diarrhœa with large, bilious, frothy stools, but no tongue symptoms. Cases of this description occurred in old residents as well as in new arrivals to the colony, and originated in all parts of the island. I was quite unable to find epidemics of diarrhœa corresponding to the hill diarrhœa of India.

Tongue Sprue.—A quite distinct and definite disease of the tongue is met with in Ceylon. The changes, atrophy of the papillæ, and superficial fissuring observed in these tongues are characteristic of the sprue tongue. I met with seven such cases in the Europeans who had for many years suffered with these mouth symptoms alone, and who had never had any diarrhœa. As a further evidence of regarding this condition as being a local manifestation of sprue, I can quote four cases in which the sore tongues developed while the patients were living in close association with typical cases of the disease. This condition is also found in the burgher community, where I met with numbers of cases occurring in the same family, and also commonly among the Singhalese prisoners and the Tamil estate coolies; the majority of cases tested gave a negative Wassermann reaction, indicating that specific disease plays no part in the production of these tongues.

Although I am inclined to regard this "tongue sprue" as being a distinct affection of the tongue and of the same nature as the typical disease, yet one must bear in mind that an atrophy of the lingual papillæ is found in other diseases, especially those characterized by anæmia, chlorosis, ankylostomiasis, and chronic malaria.

The process of destruction of the papillæ can easily be watched in the sprue tongue, after the subsidence of a localized inflammation, but should the case run a favourable course and recovery ensue, the papillæ are regenerated, as I actually observed in one case.

As a result of these studies, and basing my conclusions on clinical grounds, the evidence suggests: (*a*) that the destruction of the papillæ in sprue and in these sore tongues is of the same nature and caused by some active process, probably by some specific micro-organism, a view supported by pathological evidence, whereas (*b*) the atrophy of the papillæ in the anæmic diseases previously mentioned is of a passive nature, engendered by some general nutritional change common to these diseases, a view also borne out by pathological evidence.

Investigation on the Clinical Pathology of Sprue.

The typical colour, or lack of colour, of sprue stools is to be ascribed partly to the farinaceous diet on which the patients are fed, partly to a colourless reduction product of hydrobilirubin—called leucourobilin—and partly to the abnormal percentage of fat they contain.

The conversion of hydrobilirubin, the normal fæcal pigment, to leucourobilin (Nencki) is apt to take place in the absence of the normal pancreatic juice, and therefore also occurs in malignant disease of the pancreas, and also, according to Mayo Robson, in chronic pancreatitis, in which disease the stools resemble both in size and colour those of sprue. The alcoholic extract of a colourless sprue stool soon becomes oxidized to a yellow colour on exposure to sunlight, and when this change has occurred the typical hydrobilirubin spectrum becomes visible. In the liquid stools passed immediately before death and

also in the acute diarrhœic stools I was able to demonstrate unaltered biliverdin; besides, the gall bladder in all the six sprue *post-mortems* I performed was filled with normal amber-coloured bile; any abnormal chemical change in the composition of the bile pigments must therefore take place during the passage of the fæcal matter through the intestinal canal.

I need hardly say that the size of the sprue stools requires a little explanation; that it is due to the lack of absorption and digestion of certain bodies, such as fats and carbohydrates, there can be little doubt, as is evidenced by the immediate progressive diminution in the size of the stools which take place immediately a progressive increase in the patient's body-weight is noted.

The fat absorption, that is, the proportion between the fat ingested and the amount excreted in the fæces, was found to vary in my cases between 70 to 90 per cent., whereas in milk-fed normal subjects it is over 95 per cent.

The complete absence of any traces of pancreatic ferments, such as trypsin, which is found in normal stools, is a further peculiarity which I ascertained to occur.

All these various characteristics of the sprue stool, their acid reaction, large size, high proportion of undigested fats and carbohydrates, absence of pancreatic ferments, their similarity to those of ascertained pancreatic disease, indicate either an inefficiency or a complete absence of the pancreatic ferments in sprue.

Observations on the urine showed little of importance. The somewhat rough estimations on the proteid content of ingested milk indicate that the urea in sprue is of exogenous and not of endogenous origin, that is to say, not derived from any excess of tissue metabolism. An indicanuria in sprue has been advanced as a diagnostic point, but it is to be expected, seeing that its presence is dependent on the amount of intestinal putrefaction. Cammidge's reaction, on which great stress has been laid of recent years by Cammidge himself and by Begg as indicating some pancreatic lesion in sprue, was performed in twenty-seven sprue urines, but always with a negative result.

The saliva was found to be invariably acid and, especially in cases with acute tongue lesions and those in the last stages of the disease, with a visible growth of thrush in their mouths.

It was interesting to note that the reaction of any individual inflamed fungiform papilla was invariably acid to litmus paper.

The gastric juice has been investigated by Van der Scheer, who found a hyperchlorhydria in the majority of cases, a hypochlorhydria in others. I had only one opportunity of making such an analysis, and found free hydrochloric acid present to the extent of 4 per cent.

Blood.—A grave degree of anæmia was only found in the most advanced cases. I have recorded a fatal case in which the number of red cells never fell below 3,900,000 per c.mm., and at the autopsy a hæmoglobin percentage of 80 was found.

The Morbid Anatomy and Pathology of Sprue.

It is necessary to eliminate all factors conducing to *post-mortem* changes, especially in such a delicate structure as the intestinal mucosa. In the Tropics, in the absence of any suitable refrigerating apparatus, *post-mortem* changes made themselves apparent, more especially in the intestinal tube, with disconcerting rapidity. In making the two autopsies described in this paper, every precaution has been taken to ward against *post-mortem* decomposition. The tissues were removed as soon after death as possible (two hours at the maximum) and immediately fixed in 4 per cent. formalin.

The bodies presented the external appearances of starvation; there was a complete absence of subcutaneous and body fat; the muscles were dark brown in colour; the heart small, dark, and atrophied; in fact all the organs exhibited the same proportional degree of wasting, and weighed less than half their normal weight; this is especially the case with the liver (24 oz.), the spleen (1½ oz.), and the pancreas (1½ oz.). The liver was yellow and fatty, bile-stained in one case; the gall-bladder full of bile.

There was a great absence of fat in the great and small omenta, and appendices epiploicæ; in the abdomen the most noticeable feature was the transparent and distended ileum; no intestinal ulceration was found; the whole of the intestinal canal was covered with a layer of ropy mucus; the tongue was covered with a film of thrush; only the base of the fungiform papillæ could be distinguished; the œsophagus was covered with a yellowish substance resembling a diphtheritic membrane, composed almost entirely of yeast fungi; the bone marrow was dark red in colour and exhibited no peculiar features, either macro- or microscopically.

In smears of the liver from one *post mortem* a few yeast cells were seen, and in preparations of the intestinal mucus, stained by Gram's method, from every part of the intestinal tube, great numbers of cells and branching mycelium were found—in fact they were by far the most abundant organisms.

Yeasts were grown in glucose broth from every part of the intestinal canal, also in one case from the liver and spleen, and from the kidneys in the other, but in addition to these, cultures (made by means of a syringe) from the heart's blood yielded a growth of *B. coli*, apparently of two varieties, most probably denoting a secondary and terminal infection. Great interest centres in the microscopical structure of the intestinal canal; the stomach appears normal, but the remainder of the intestinal tract from duodenum to rectum exhibited chronic inflammatory changes; in the small intestine the villi are quadrangular in shape and shrunken; the columnar surface epithelium is for the most part preserved, but the cells stain badly, and the nuclei can with difficulty be distinguished; it is possible that a certain amount of epithelial destruction took place during the last few days of life, as both patients were comatose for ten days or more before death.

Of the other organs examined, the condition of the

liver and spleen only calls for special attention. The cells of the former have undergone fatty degeneration and contain a few granules of free iron, though this reaction is by no means so well marked as in pernicious anæmia; in the spleen there are certain hyaline bodies, probably of a degenerative nature, in the swollen endothelial cells of the venous sinuses, which I believe to be pathognomonic of sprue. I would impress on you that this is a well considered statement, as I found these bodies in all the six sprue spleens I have examined, but not in those of other diseases, of which I have examined forty-three in all, of ankylostomiasis, malaria, pernicious anæmia, lymphatic and splenomedullary leucocythæmia, kala azar, trypanosomiasis, filariasis, amœbic and bacillary dysentery, &c., as controls.

The bodies are of a small size and show no affinity for fuchsine, and are Gram-positive. By Giemsa they attain different shades of pink, violet, or blue; the cells in which they are situated are swollen almost to bursting point, and their nuclei cannot be distinguished; the absence of any differentiation in their structure and the lack of surrounding tissue reaction negatives their parasitic origin. As to their exact nature, I have been unable to reach any definite conclusion, but I am inclined to regard them as being possibly produced in response to the extensive yeast infection found in sprue. In support of this view I can adduce but one fact, namely, that bodies giving the same staining reactions were present in the capillary endothelium of a rabbit's liver after intravenous injection with yeast isolated from a sprue saliva, but a similar degeneration of the spleen could not be produced by these means.

These bodies must be distinguished from other Gram-positive but acid-fast bodies, identical with Russell's bodies, which are commonly found both lying free and in the interstitial cells of the sprue issues, especially in the alimentary canal, but this is not their only situation, as they are found in many other organs; nor are they to be regarded as distinctive of sprue, as I found them commonly in ankylostomiasis, malaria, and tubercular tissues. Russell's bodies were at one time considered to be protozoal organisms and the cause of tumour growth, but they are of further interest to the tropical pathologist as they have been described as an organism—*Botromyces ascoformans* (Bollinger, 1869)—and have been described by Archibald in botromycosis, an actinonyeotic disease of horses and camels, sometimes found in man. My investigations on this subject certainly suggest that these structures represent a hyaline degeneration, and therefore cannot be regarded as representing a parasitic organism.

Evidence of Association of the Thrush Fungus with the Symptoms of Sprue.

Intracellularly situated yeast cells and mycelial elements were found in scrapings of the inflamed tongues during the acute stage, and could be cultivated in glucose broth from 50 per cent. of sprue tongues, but only from 17 per cent. of normal tongues; in the saliva they were commonly found in numbers by direct microscopical examination in twenty-four sprue cases, and could be cultivated in 55 per cent., but only in 35 per cent. of normal cases.

These observations on the abundance of yeasts in the saliva are of importance in another direction. In the last few years Castellani has published a number of papers on a tropical respiratory disease termed by him, variously, tropical bronchomycosis, bronchoblastomycosis, bronchoidiosis, and bronchomoniliasis. The subjects of this infection are said to exhibit symptoms of a subacute bronchitis, resembling tuberculosis, and called by him "tea factory cough"; he has, however, failed to find tubercle bacilli, but has in some cases found numbers of yeast cells in the sputum on microscopical examination. In others in which they were less numerous he was able to isolate them on culture. So far he has adduced no evidence, either by *post-mortem* or microscopical examination, that any invasion of the bronchi or the lungs by these yeasts has, in cases presenting these symptoms, in reality taken place during life.

My observations on this subject certainly indicate that these fungi are common saprophytic organisms in the saliva of Europeans and natives in the Tropics, and it therefore follows that their presence in any given sample of sputum to which necessarily an admixture of saliva has taken place does not necessarily denote a pathogenic action on their part; certainly none of my sprue patients on whom these observations were made were suffering from "tea factory cough" or had any physical signs in their chest.

In fresh preparations of the frothy, acid stools passed during the early stages of the disease I saw cells and some mycelial threads bearing a great resemblance to yeast cells and exhibiting an affinity for iodine; there is no doubt that they are by far the most predominant form of micro-organism in the stools passed shortly before death, as I have found them in great numbers in simple smear preparations, and on culture yeast colonies formed 75 per cent. of all organisms; in the centrifuged deposit of sprue stools, stained by Gram's method, a great number of yeast cells were found in 72 per cent., but they were only found in small numbers in 25 per cent. of normal and amœbic dysentery stools treated in this manner; by cultural methods yeasts were cultured from 58 per cent. of sprue stools as against 29 per cent. of control cases.

These figures by no means indicate the prevalence of yeast cells in sprue stools, as in patients under treatment I found I was unable to cultivate them once the stools had become solid, though I was able to do so from every case during the acute diarrhœa stage.

Although it is difficult, in view of the uncertain nature of the whole subject, to draw any definite or positive conclusions, yet I submit that these observations indicate that not only can yeasts be cultivated from the majority of sprue stools and salivas, but that in the acute as well as in the terminal stages of the disease they are at least the most prevalent

organism in the tongue lesions, salivas, and stools of victims of the disease.

Cultures from Aphthæ.—I can advance cogent reasons for disregarding these buccal ulcers as being an essential lesion of the disease. My reasons for so doing are, firstly, that they are not present in every case, not even in the two I observed which terminated fatally; and secondly, that similar lesions are found commonly in perfectly normal subjects presenting no sprue symptoms whatsoever. I examined the organisms found in these lesions, both in scrapings and cultures, in ten instances; in these I found yeast cells, but no mycelial elements; the *Staphylococcus pyogenes aureus* and the *Streptococcus brevis* were the commonist organisms found, and similar organisms were isolated from buccal aphthæ in normal subjects. I consider, therefore, that they merely represent a secondary and localized pyogenic infection of a mucous membrane, the resistance of which has already been lowered by the cachectic state of the patient, or by a primary infection of the thrush fungus.

A Study of the Yeasts found in Sprue Lesions and Attempts to classify them on a Rational Basis.

The blastomyces, or yeasts, are distinguished from the true fungi by their peculiar method of reproduction by gemmation. Some kinds, under adverse circumstances, reproduce by means of spores called asco, or clamydospores, and they can be classified into two main groups: (1) the *Saccharomyces* and (2) the *Torulæ*, according to whether they form spores or not. Amongst the former of these groups a third method of growth by means of mycelial threads may also arise, and according to the presence or absence of this mycelium formation the *Saccharomyces* may be divided into two sub-groups, the first of which may be termed the *Saccharomyces proper* and the second the genus *Monilia*, and it is to the latter that the thrush fungus belongs.

In my attempts to classify the yeast fungi found in sprue, and in order to compare them with other yeasts, I examined 112 cultures obtained in Ceylon from various sources; five were cultivated from thrush lesions in infants, and were compared with others from the mouths, stools, and *post-mortem* tissues of sprue, and also with cultures obtained from the air, from cow dung, from fruit, milk, and from a baker's yeast; out of these 112 cultures 106 could be classified in the genus *Monilia*, that is, that they reproduced by spore and mycelial formation.

Evidence in favour of regarding Sprue as a Blastomycotic Infection.

(1) Yeast cells and mycelial elements are found in scrapings of the tongue lesions at an early stage of the disease, and cannot be found at a later stage in scrapings of the same structure when symptoms have subsided.

(2) Yeasts are the only organisms found in the deep layers of the tongue in microscopical sections; the evidence that this infection is not one of recent date receives support from the chronic inflammatory changes in the corium of the papillæ, and from the presence of Russell's bodies in this situation.

(3) The desquamation of the epithelial cells, accompanied by subacute inflammation of the tongue and of the œsophagus, are changes such as would be expected from a study of the mode of growth of the thrush fungus and of its low order of virulence.

(4) A general infection of the intestinal mucus with yeasts was found in sprue *post-mortems*, but no such general infection in twenty-six cases of other chronic wasting diarrhœas.

(5) The stools of sprue, their frothy and gaseous character, are such as one would expect in such a blastomycotic infection of the intestinal canal.

(6) The relapsing nature, the chronicity and latency of the disease, are such as one would expect from the life history of the blastomyces, their periods of attenuated growth and powers of sudden recrudescence.

(7) There is no evidence in favour of regarding the sprue yeast fungus as being otherwise than incidental with the thrush fungus (*Monilia albicans*), an organism possessing a very low pathogenic power, but it is possible that under certain conditions, as for instance in the tropics, this power may be greatly augmented. In support of this view I may add that it is a well-recognized fact that there are endless varieties of yeasts employed in brewing beer and in making wine, and the predominance of one variety in certain districts imparts to the local wine its characteristic flavour, which, though differing widely from each other in their powers of growth and fermentation, yet resemble each other minutely in their morphological and cultural characters. May it not be that their pathogenic as well as their other properties are capable of being altered by local conditions?

(8) Wasting and anæmia, both symptoms of sprue, can be produced by continuous intravenous injections of small doses of a broth culture of a pathogenic yeast; moreover, a degeneration of the hepatic capillary endothelium, apparently similar to that found in the sprue spleen, may be produced in these animals by the same means.

(9) Diarrhœa, atrophy of the lingual papillæ as in sprue, digestive disturbances, and an aphthous ulceration of the mouth are commonly found in infants, the subjects of thrush infections in temperate zones.

(10) It is possible that obscure diseases of the alimentary canal in children in temperate zones, such as Gee's cœliac diarrhœa, are of the same nature as sprue in adults in the tropics. A hypothesis of this sort would explain the occurrence of sporadic cases of sprue in temperate zones.

(11) The local affection of different portions of the digestive tract with this fungus would best explain the varying clinical manifestations of sprue.

(12) To maintain such a hypothesis it is necessary to stipulate for a third factor, a predisposing cause, which may exist in the local tropical climatic conditions, which favour a more precocious and luxuriant growth of all the fungi, a matter of common observation to all laboratory workers in the Tropics.

Evidence against regarding Sprue as a Blastomycotic Infection.

(1) The thrush fungus (*Monilia albicans*) is a terminal, though uncommon, infection in other chronic wasting diseases, such as phthisis, cancer, diabetes, &c.

(2) General infections of the alimentary canal with this fungus have been reported in temperate zones.

(3) If the geographical distribution of sprue be eventually found to correspond with that of other typical tropical diseases, such a fact alone is in favour of a protozoal, rather than of a fungoid or bacterial, origin of the disease.

CONCLUSIONS.

(1) Sprue is a specific disease of tropical and subtropical countries, though it is possible that cases occasionally originate in temperate zones.

(2) It is a disease prevalent in Ceylon, especially amongst the Europeans, but contrary to the opinion hitherto held, it may also occur in the native, irrespective of race or mode of life.

(3) This fact, together with the occurrence of the disease in people closely associated, suggests a local influence or some communication from man to man.

(4) Sprue is a variable disease; it may occur in a mild or in a particularly virulent form, and in common with many other serious diseases, it is sometimes liable to sudden remissions and latent periods.

(5) There is evidence that the disease may occur as distinct and specific clinical forms according to the portion of the alimentary canal attacked.

(6) Researches on the composition of the stools point either to a complete absence or insufficiency of the intestinal digestive ferments.

(7) Researches on the blood and urine are in favour of regarding sprue as an alimentary toxæmia.

(8) The pathological findings are also in favour of this supposition and point to an infection with the thrush fungus (*Monilia albicans*) as being the organism concerned in its production; the evidence is, on the whole, in favour of rather than opposed to this view

Review.

TROPICAL DISEASES: A PRACTICAL HANDBOOK. By H. C. Lambart, M.A., M.D., &c. With 6 coloured plates and 82 other illustrations. Pp. xv + 324. London: Charles Griffin and Co., Ltd., Exeter Street, Strand. 1914. Price 8s. 6d. net.

This book is intended as a manual for medical men and students, and is so arranged alphabetically that it shows at a glance the diagnosis and treatment of the principal tropical diseases. The subjects are treated in the simplest manner possible, the pages being nowhere encumbered with disputed points or unsolved theories, its main object being to supply the readiest reference.

The author has spent many years in the Tropics and has evidently made the most of his time. Although the descriptions of the various diseases are brief, they are to the point and cannot but be of great assistance to any practitioner who is just starting work in the Far East.

Aids to diagnosis, bacteriological methods, special diets, eye diseases, geographical distribution, fevers and skin diseases are grouped under separate sections and special attention is given to treatment. The therapeutic index, with prescriptions and lines upon which treatment should be based, has been brought up to date.

The type is good and clear, and the illustrations, many by the author himself, satisfactory. This little manual can be thoroughly recommended to anyone who has to get up a working knowledge of tropical diseases within a limited time; especially those who want a purview of the subject when commencing a course of lectures.

Correspondence.

KURLOFF'S BODIES.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE.

SIR,—I beg to correct two misstatements about me that were published in THE JOURNAL OF TROPICAL MEDICINE of May 1 and May 15 last respectively. In your issue of the former date it is stated that two workers in India have shown that Kurloff's bodies are granules, &c. The article implies that this disproves my recent work on the subject which shows these bodies to be parasites. Such an implication is untrue. The parasitic nature of these bodies has now been proved. They have been transferred naturally through several generations of guinea-pigs, develop into spirochætes, and pass through the placenta. An allied species of parasite produces disease in rabbits, has been passed artificially from rabbit to rabbit, and has been inoculated into monkeys, producing death. The same parasites have been recovered in the monkey. And thus Koch's postulates have been fulfilled showing these bodies to be disease-producing parasites.

In your issue of May 15, it was stated that I have been conducting a campaign against house flies in New York. This is incorrect. I have never been to New York. The statement originated in a letter of mine published in *The Times* of January 31 last. This letter pointed out that a successful campaign had been conducted in a part of New York by Dr. Donald Armstrong, of the New York Association for Improving the Conditions of the Poor. Apart from this letter, I have had no hand in the campaign.

I beg that you will publish this correction so that justice to the real organizer of this excellent work may be done. Yours faithfully,

E. HALFORD ROSS.

The John Howard McFadden Researches at the Lister Institute.

[It is hardly likely that "E. H. Ross, of New York," should be taken as meaning Dr. Halford Ross, of the Lister Institute of Preventive Medicine, Chelsea Gardens, S.W.—ED. *T.M.*]

We hear with great regret, as we go to press, of the death of Mr. Joseph Chamberlain.

Original Communication.

ANKYLOSTOMIASIS IN THE NORTH NYASA DISTRICT.

By A. G. ELDRED, M.R.C.S., L.R.C.P.Lond.
Medical Officer, Karonga, Nyasaland.

DURING the latter part of the year 1911 a severe case of ankylostomiasis was reported from Vua, in the North Nyasa district. This particular helminth had previously been recorded in various parts of Nyasaland, but there were no general statistics of the percentage of natives infected, &c.

In view of the fact that Vua was expected to become the centre of the cotton growing industry in the North Nyasa district, and that ankylostomiasis might prove to be the reason for the difficulty in obtaining efficient local labour, it was decided to investigate the matter more thoroughly.

During the few weeks that I was stationed in Karonga, early in 1912, there was no time for a thorough investigation, but the cases I found then led me to suggest that the infection was not limited to Vua, and that probably a systematic examination of the general population would show a large proportion to be infected.

A report by the Medical Officer of Karonga in 1912 (Dr. Conran) showed that at least 41 per cent. of the population were infected. It was decided to continue the investigation, and to enforce such prophylactic measures as were practicable.

A total of 1,500 natives have been examined during the past seven months, all infected individuals given treatment one or more times, and such prophylactic measures as were practicable and possible under existing conditions carried out.

(*A*) DESCRIPTION OF DISTRICT.

(1) *Physical Features.*—North Nyasa consists of two distinct portions: (1) A narrow strip of almost entirely flat country at the lake level (1,500 ft.), about 10 miles in width and 70 miles long, bounded on the east by the lake and on the west by the mountains. Directly on the lake shore, and for a mile or two inland, there are numerous villages, but as the hills are approached the population becomes scanty, except near the larger rivers. Along the lake shore and often for half a mile or more inland the soil consists of pure sand, and more inland of more or less sandy earth. On this sand or sandy earth the majority of the villages are built. There are numerous rivers and streams, but all except four or five are dry in this area for at least nine months in the year. There is no thick forest, but a profusion of small trees and scrub scattered about on the grassy plains. In and around the villages are thick banana groves. During the rainy season (December to April) this flat country is in many places waterlogged, and during this period the population in such areas move a short distance away to some slightly higher and drier spot, returning to the original site after the rains. The people derive their water supply from either the lake, the rivers, or from water holes and wells. (2) A mountainous portion composing the remainder of the district, thinly populated, well wooded in many places, and with a soil consisting largely of coarse gravel.

The percentage of ankylostome infection has been shown by Dr. Conran to be highest in the lake level area.

(2) *Inhabitants.*—The great bulk of the population at the lake level consists of Ankonde, or allied people. There are also settlements of Henga, a hill tribe, of Awemba, originally from Rhodesia, and some so-called Swahili. The principal hill tribes are the Henga, in the southern portion of the district; the Poko, on the Nyika plateau, and the Misuku, in the north-west portion. The Ankonde, the original inhabitants of the lake level area, are a peaceful, cattle-breeding race; their one purpose in life appears to be the well-being of these cattle. Their food consists principally of sour milk and bananas, possibly a valuable diet in an emergency, but as staple articles of food not calculated to produce a race of virile workers.

There appears to be no doubt that the Ankonde are inferior to the Ahenga, Awemba or Swahili as workers, and it was thought that ankylostome infection might be the reason.

(*B*) PROCEDURE ADOPTED.

(1) It has been shown that the usual route of infection in hook-worm disease is through the skin, infection being acquired by walking over infected ground containing embryos which have developed from the ova voided with the fæces. It is therefore evident that any campaign against such a disease, to be permanently successful, must be very thoroughly carried out; treatment of a small percentage of the infected individuals in one locality, though temporarily benefiting a few, will not go far towards eradicating the disease in the community, nor is treatment of much avail unless very efficient sanitary precautions are taken by the people generally; for if these are neglected, reinfection will almost certainly take place, the condition of things becomes as bad as before, and time and money have only been wasted. Consequently, the only efficient way to deal with the question is to systematically work through each village, examining every individual in it, treating the infected ones and at the same time establishing proper latrines and sanitary reforms generally in these villages. With this object in view the following action has been taken:—

(*a*) The chiefs and headmen of the various villages have been called in before the Resident and Medical Officer, and the nature of the disease and the preventive measures to be adopted explained to them. They have been shown the type of latrine that should be adopted.

(*b*) A systematic examination of every individual in the surrounding villages is being carried out.

(*c*) Printed notices in the Wankonde and Ahenga languages, explaining in simple terms the nature of the disease, and the precautions to be adopted, have been printed and circulated.

(2) *Difficulties in the way of affecting a rapid Improvement over a large Area.*—It has, I understand, been suggested that a 25-mile radius from Karanga should be taken, and this area dealt with first.

I should like to take this opportunity of pointing out a few of the difficulties that are to be encountered in dealing with such a disease as ankylostomiasis in a native population, and without a large staff of workers and especially in such a district as this, where the population is extremely scattered, and where, owing to this and to the nature of the district, travelling takes up a large amount of time. These difficulties are caused by :—

(3) *Time involved in Diagnosis and Treatment.*—The diagnosis and treatment of ankylostomiasis necessitate the following procedure:

(*a*) A microscopic examination of the fæces for ova.

(*b*) A clinical examination of infected individuals.

(*c*) Anthelmintic treatment of these individuals.

To be thorough re-examination and, if necessary, further treatment should be undergone in a week or two. In regard to (*a*) I am at the present time examining slides at the rate of 20 to 24 per diem, and find that this is the maximum average that can be maintained by one worker if each slide is thoroughly examined and when various other duties are included, such as the clinical examination and treatment of the infected individuals, and inspection of villages.

As the sphere of action widens, the time taken up in travelling and inspecting will probably lower the above average, but, assuming that one worker could continue to examine slides at the rate of 400 to 500 a month, and the population of the whole of North Nyasa being over 38,000, we get the following results :—

One worker would take over seven years to complete the examination of the whole district, and over three and a half years to complete the examination of the inhabitants of the 25-mile radius where the population is estimated at nearly 19,000.

(*b*) is merely a question of time involved, but is advisable.

(*c*) is important for the following reasons :—

The curative treatment of hook-worm disease does not consist in merely handing out a dose of medicine to each individual who is infected, but requires four separate administrations of two or more rather unpleasant and in some cases dangerous drugs ; during which period of administration it is necessary that no food, very little liquid, and in the case of thymol or beta-naphthol no alcohol, should be taken. Moreover, a large proportion of the infected individuals only complain of minor symptoms, and many deny having any symptoms at all ; consequently it is probable that they will seldom follow out the above treatment, except under supervision.

An alternative method of treatment would be to dispense with the microscopic examination, and to dose every individual who complained of symptoms that might be due to ankylostomiasis. This could be fairly rapidly done by training several natives in the prominent symptoms to be sought for, and in the method of administering the anthelmintic ; such a haphazard course is open to obvious objections, and many cases would be missed.

(4) *The Existing Type of Villages.*—The main population of North Nyasa is not contained in a series of large villages or towns, but scattered over the 4,000 odd square miles which comprise the district are a multitude of tiny settlements, often consisting of only a hut or two, separated from neighbouring ones by several hundred yards, while possibly sixty, eighty, or more of these huts go to make up one of these so-called "villages." There are of course a certain number of large and compact villages, but these are in the minority. As long as these villages remain as they are it will not be possible to establish a satisfactory system of public trench latrines, for it is certain that in such a scattered community they would not be used by the majority, and the present alternative is a latrine for almost every house, rendering the work of inspection much more difficult, and the probabilities of the ground near the huts becoming infected much greater.

(5) *Areas dealt with.*—In view of these facts the following procedure has been adopted :—

A small area has been taken in hand, with the object of thoroughly dealing with it. This area consists of a strip extending inland from Karonga for about 10 or 12 miles, and for about 15 to 20 miles north and south. This strip contains roughly 14,000 people in an area of 400 square miles, or 35 inhabitants to the square mile, whereas a 25-mile radius from Karonga contains about 19,000 people in an area of 1,000 square miles, or only 19 inhabitants to the square mile. In this way a small area can be fairly satisfactorily dealt with, and at the end of a year re-examination would show whether sufficient improvement had resulted to justify a campaign on a large scale.

(*C*) Curative Measures.

Practically all the people in the immediate vicinity of Karonga have now been examined and treated, and also as many cases as possible in the area mentioned under *C*. Stray cases in the dispensary, and such as have been found while inspecting the district, have also been treated. All infected individuals have been given one course of treatment, either with beta-naphthol or eucalyptus oil. It was obviously impossible to re-examine every case, but from nearly 100 cases that I was able to re-examine it is evident that one course of treatment is frequently inadequate. (See Table IX.)

Very little desire is shown by these people to come up for treatment, and in most cases they refuse to accept re-treatment, their symptoms being slight or nil, but in order to try and induce them to do so a ticket has been given to every case of ankylostomiasis found, and the recipient informed that on presenting this ticket at the Karonga Dispensary free treatment is available. It is possible that in this way any cases which at some future date may develop severe symptoms may be got hold of and cured. As has already been shown it would take years to examine the whole population for ankylostomes.

(*D*) Preventive Measures.

These have been conducted on the lines detailed under (*C*), (1), (*a*), (*b*), *and* (*c*).

Notices have been sent to all the chiefs and headmen in the area, and to a great number in the rest of the district.

I have inspected a large portion of the district and it is now possible to say that latrines have been built, and are at present being used, and the sanitary condition of the villages is in general better. As several people have said, it is now possible to camp *outside* a village on sites that were before impossible owing to the insanitary and promiscuous habits of the inhabitants.

In the Henga Valley, and in other parts of the hill district, the latrines either had been built or were built before I left the village, but opportunities for the inspection of villages 100 miles or more away are naturally rather rare. With regard to the type of latrine that has been adopted, not only is the shallow trench latrine not advisable, but it is very difficult to induce the native to adopt any form of public latrine, nor are the villages at present adapted to such a thing. Consequently, nearly every family has its own little private latrine, a pit about 4 to 6 ft. deep, with a thatched roof. Until the villages are concentrated it will be advisable to allow those private latrines to be used, but with a properly planned-out native village, the best arrangement would be one or more deep trench latrines for each village, according to requirements. The Village Ordinance of 1912 is now applied to the North Nyasa District, and this will certainly render it easier to insist on sanitary measures being adopted.

(*E*) Results of Investigations.

(To be read in conjunction with the tables.)

Tables I and II.—The 1,500 people examined were of all ages and both sexes, from all parts of the lake level area, and from a portion of the hill area.

The primary object of the investigation was the finding of ankylostomes, and as a rule other helminths were merely noted when seen; consequently, as will be observed by reference to Dr. Conran's Report, the actual percentage of other helminths therein noted is higher than appears in *these* tables.

In certain villages, to be enumerated later, the correct bilharzia percentage was taken, and the bilharzia percentages given in Table VI are correct.

Strongyloides are not included, as in many cases by the time the specimens were examined the stools were from four to six hours old, and though rhabdite embryos were sometimes seen, it was always in association with ankylostome ova; so it is possible that those embryos were those of ankylostomes.

Trichocephalus appears to be most prevalent in the north-east part of the district, in the Songwe River area, and a very large number of the cases of ascaris infection were also found in this part (32 per cent. in one village). The Songwe is the rice growing area.

Table III.—Villages 1, 2, 3, and 13 are built almost directly on the lake shore, 4 to 9 and 12 are from one to three miles inland, 10 is about six miles inland in the marshy country near the Songwe River, and 11 are villages about eight miles inland near the foot-hills.

The Henga Valley is in the southern part of the district at an elevation of about 3,000 ft.

The Bilharzia percentage is correct for numbers 1, 3, 4, 5, 7, 8, and 12.

Table IV.—With the exception of the hill Henga, the tribes mentioned were living at the lake level.

The relatively low percentage in the Ahenga living at lake level is in part due to the comparatively small number examined, and the fact that they lived in an area where the percentage for other villages was low.

Table V.—This shows the liability to infection at various periods of life. Owing to the usual route of infection, through the skin of the feet or legs, it is only natural that in actual infancy (*i.e.*, before the child can walk) the percentage of infection should be low. Once infancy is passed the age of the individual has very little influence on the liability to infection, and the same holds good in regard to sex.

Table VI.—The soil of the lake level area is, in and around most villages, either pure (in the geological, not the sanitary sense) sand or sandy earth, as already mentioned. Now the percentage for villages in general directly on the lake shore is 40 per cent., and for villages a mile or so inland is 48 per cent., so that at first sight it would appear that soil and water do, in the lake area, influence the percentage slightly. But on reference to Table III, we find villages Nos. 1 and 3, both built on exactly similar sites, directly on the lake shore, and on sand, with such widely different percentage as 56 per cent. and 27 per cent. It would appear that soil and water supply have not much bearing, one way or the other, at the lake level. It is probable that the lower percentage in the hills is due in some degree to the totally different nature of the soil.

Table VII is an analysis of the symptoms usually met with. The various symptoms enumerated were found to occur either singly, or two more in conjunction.

Gastro-intestinal.—Including pigmentation of or purple streaks on the tongue, colic, epigastric pain, diarrhœa.

The changes in the tongue were found just as commonly in the uninfected native.

Diarrhœa, when complained of, was said to take an intermittent form, lasting a few days, and then disappearing for weeks or months.

Dysenteric.—In most instances, when blood was actually found in a specimen, in a case of ankylostomiasis, bilharzia ova were present.

Circulatory.—Irregular action of the heart, palpitation, hæmic murmurs, and in some cases evident organic lesions, the latter probably not associated in any way with the presence of ankylostomes. Dilatation of the heart was very seldom seen.

Joint Pains.—The pain in the sternum, mentioned by various writers, was sometimes complained of, and often rheumatic pains in various joints. Joint pains are, however, so often complained of by un-

infected natives that this symptom is not regarded as possessing much value.

Anæmia.—There were no facilities for obtaining the true hæmoglobin percentage in these cases, and only a rough-and-ready test of anæmia, by examining the conjunctiva, could be applied. In a great number of cases all symptoms were denied, and the only sign of departure from normal that could be attributed to ankylostome infection was a mild degree of anæmia.

Other symptoms, not included in Table VII:—

Ground Itch.—No reliance can be placed in any past history of this in a native, who suffers from so many lesions of the skin of the feet and legs; no typical ground-itch rash was ever seen in a native, though in the case of a European the presence of the typical rash on the ankles gave the clue to the disease.

Earth-eating, or Geophagy.—A small percentage of both infected and uninfected acknowledged to this practice, and it is probably quite a common one in fact, though often denied. It does not appear to be a regular or constant practice, and probably bears very little, if any, relation to ankylostome infection.

Signs of Severe Infection, General Œdema, Extreme Anæmia, Muscular Wasting, &c.—Very few really severe cases were seen, and no cases of arrested or retarded development were observed. All the cases seen during the last six months are being kept sight of as far as possible, and up to now only one is recorded as having died, a boy of about 8, with extreme anæmia, chronic diarrhœa, and œdema. He also had chronic malaria.

Examination of Specimens.—The number of ova found was almost always small, often only one in the whole slide, and very seldom more than four or five. The number did not appear to bear any relation to the severity or otherwise of the symptoms. The specimens were examined by direct admixture with water, as time did not permit of the centrifugal or other methods being employed.

Table VIII.—From June to the middle of December the rainfall is practically *nil* in this district, consequently one would expect, as is the case, very little variation in the percentage during these months.

Table IX has already been discussed under Curative Measures.

Table X.—Explanation of terms:—

Carriers.—Individuals, usually of good physique (for the native of this locality), denying illness, and apparently in good health, and either showing no symptoms due to ankylostome infection, or at most a mild degree of anæmia.

Mild Cases.—Of good or fair physique, in some cases anæmia, and showing in a mild degree one or more of the symptoms detailed in Table VII.

Moderate Cases.—Accentuation of the symptoms found in the "mild" cases, and including cases showing evidence of circulatory changes, and obvious bad health that might be due to ankylostome infection.

Severe.—In which there is every probability of a fatal termination, with such symptoms as extreme anæmia, wasting, œdema, &c.

The remaining tables will be considered in the concluding portion of the Report.

(*F*) REASONS FOR ASSUMING THAT THERE IS, IN THIS PART OF THE PROTECTORATE, A RACIAL IMMUNITY TO THE SEVERE EFFECTS OF ANKYLOSTOME INVASION, AND THAT THE LACK OF EFFICIENCY, AS LABOURERS, CANNOT IN THE ANKONDE BE ASCRIBED TO ANKYLOSTOME INFECTION.

In clinically examining every day a number of natives whose fæces on microscopical examination had shown ankylostome ova the mildness or even absence of symptoms and the remarkable rarity of severe cases soon became apparent, and made one wonder whether ankylostomiasis was seriously affecting the health of these natives as a community, or even in the majority of cases as individuals, and also whether the inefficiency of the Ankonde as a worker could really be attributed to ankylostome infection.

It seemed advisable to attempt to settle the question, both to avoid disappointment in the possibly anticipated improvement in the working capacity of the Ankonde, and also because to deal thoroughly with ankylostomes in such a district, and among such a community as this, would be an exceedingly costly and lengthy undertaking.

The method adopted has been to examine both infected and non-infected individuals, noting their general development, symptoms possibly caused by ankylostomes, other diseases, mode of life, surroundings, &c.

Table XI is for adults, and shows the results of this comparison of infected and uninfected individuals. Under general development they have been divided into good, fair, and bad; good indicates good development and physique as represented by the native of this district, and not of Africa in general. No one, I imagine, would call the North Nyasa native a fine type, as compared with other tribes and races. Of course exceptionally fine men are seen from time to time, but as a general rule, both intellectually and physically, the type is anything but high.

Referring then to Table XI it is seen that as far as general development is concerned, the presence of ankylostomes has no effect. Again, with anæmia, circulatory changes, and joint pains, just as many uninfected people show these changes, and so many other diseases may produce these symptoms, for malaria, yaws, syphilis, leprosy, and a host of chronic ulcerations, all exist in this district. The pigmented condition of the tongue is just as common in the uninfected native. The presence of ankylostomes evidently does affect the gastro-intestinal tract in these people, but here again it must be remembered that many of these cases are complicated by bilharzia, and that digestive troubles are very common in the uninfected native.

Tables XII and XIII.—It might be suggested that the children were the sufferers, as is the case with malaria in the native, and that, as adult life was approached, an immunity to the severe effects of ankylostome infection was established.

Table XII shows that this can hardly be the case, and that malaria, the great factor of ill-health in native children, has also to be taken into account. Now, enlargement of the spleen, in children especially, may fairly be ascribed to malaria, as ankylostomiasis produces no special changes in the spleen, and malaria causes anæmia.

Table XIII shows the spleen and anæmia-rate in infected children; the deduction being that 59 per cent. of children with ankylostomes are also infected with malaria, 21 per cent. are normal, and the remaining 20 per cent. are suffering from a certain degree of anæmia, probably not due to malaria, and possibly due to ankylostome infection.

Other Facts.—As has been said, the average type of native here is not particularly well developed, but occasionally exceptionally fine men, comparing favourably with the best type of African one could pick out, are seen. Such men on being examined have in most cases been found to be harbouring ankylostomes, and it certainly could not be said that their health was affected.

Thirty carriers were taken on a journey of 300 miles, and the capability of each individual as a worker was noted. They were all examined for ankylostomes, and 50 per cent. of them were found to be infected; intestinal bilharzia was found in 33 per cent. The infected ones worked just as well, and appeared to have just as much stamina as the uninfected. Five of these thirty men were decidedly better than any of the rest as workers, and three of the five had ankylostomes.

The percentage of infection is just as high in some other parts of the country. In the South Nyasa district, for example, it is 44 per cent. and there is there, as far as I know, no complaint about the inefficiency of the native as a worker.

With regard to the Ankonde, reference to Table IV shows that the percentage of infections is no greater in them than in any other tribe. Moreover, they are of no worse physique than the other local tribes, nor do they show any more evidence of suffering from the effects of the infection.

The capabilities of the various tribes as workers, in order of merit, and their staple diet, are shown in the following table :—

Tribe	Staple diet
Awemba	Maize, cassawa.
Ahenga	Maize, millet, cassawa.
Swahili	Rice, and occasional maize.
Ankonde	Sour milk, bananas.

According to local employers of labour, the Ankonde come a very bad last as workers. It is evident that this cannot be due to ankylostomes, and it would appear to be a purely racial reason, not due in any way to disease. As has been suggested food may be a possible factor. There is no special endemic area, but ankylostomes are found in over 60 per cent. (actual) of the inhabitants of the lake level area, irrespective of locality or tribe.

The infection is no worse among the Ankonde than any other local tribe, and the inferiority of the Ankonde as workers cannot possibly be ascribed to ankylostome infection. Of the infected individuals in this district 31 per cent. show no departure from health due to harbouring ankylostomes, and 27 per cent. only a mild degree of anæmia, that may or may not be due to ankylostome infection; that is to say, nearly 60 per cent. can fairly be classed as "carriers." Another 37 per cent. have only mild symptoms, and though it is probable that they have been harbouring ankylostomes for years, are not suffering any serious inconvenience on that account. Severe cases are extremely rare, for if existing in any number, they must certainly have come to notice in examining such a large number of people.

To put it in another way, if 1,000 infected natives were examined, 580 would be found to be unaffected by the presence of the parasite; 370 would hardly know that they were affected, owing to the mildness of their symptoms, forty-five would complain of ill-health, though it is possible that this ill-health would in many cases be due to other causes; and five would be in a really bad state of health. In short, in spite of over 60 per cent. of them being hosts of this worm, very few seem much the worse for it. In other words, there is here a very high relative racial immunity.

However, there is no doubt that the native would be better without his ankylostomes, and though it does not appear to be necessary to enter upon a costly and extensive campaign, much may be done on the lines suggested by Dr. Conran in his Report. Therefore, the aim should be to improve sanitary conditions on the lines already suggested, and to treat such cases as are obviously suffering from the effects of ankylostome infection: in this way it is possible that a gradual improvement will be effected; but to examine and treat all the people in this district who harbour ankylostomes would, unless about a dozen doctors or microscopists were employed, be a most lengthy business, and not of much value unless one could ensure that reinfection would not occur. Before any real and permanent sanitary improvement can be effected there should be provided: concentration of the villages, and sanitary inspectors to see that the standard is maintained, that villages are built on proper lines, and that the latrines are maintained and used. These inspectors are, I understand, to be supplied next year.

With regard to the concentration of villages, this is one of the most important points, and, in every instance where new villages are contemplated the chief or headman should be required to notify the resident, who, with the advice of the Medical Officer, would give instructions as to site, type of village, spacing of huts, water-supply, &c. A definite set of rules for the planning-out of new villages might well be drawn up.

The fact that a general exodus is unusual, the inhabitants of the village drifting away a few at a time, appears to be one reason for the scattered nature of the villages, and may prove one of the difficulties to be encountered in getting a better type of village adopted. The existing type has been described, and it is obvious that such a type can never be maintained

in a sanitary condition unless the inhabitants are sanitary enthusiasts, which these certainly are not.

Unless otherwise stated, percentages refer to ankylostome infection. "Infected" means ankylostome ova found in the fæces on microscopical examination. The percentages stated are the actual percentage in which ankylostome ova were found, and 20 per cent. should be added for error.

The slight difference in the percentages under similar heads in Tables VII and XI is due to the fact that about 100 of the people examined to compile Table VII were not examined for Table XI.

TABLE I.

Parasite	Number of people examined	Number infected	Percentage
Ankylostome ...	1,500 ...	650 ...	44 lake 16 hills
Bilharzia	*Vide* Tables II and III	245 ...	16
Ascaris	,, ,, ..	91 ...	6
Trichocephalus ...	,, ,, ...	17 ...	1
Total helminths	,, ,, ...	824 ...	55

TABLE II.

SINGLE INFECTIONS.

Ankylostome Per cent.	Bilharzia Per cent.	Ascaris Per cent.	Tricocephalus Per cent.
32 ...	8 ...	1·7 ...	0·5

DOUBLE INFECTIONS.

Ankylostome, bilharzia Per cent.	Ankylostome, ascaris Per cent.	Ankylostome, trichocephalus Per cent.	Oxyuris, ascaris Per cent.	Bilharzia, ascaris Per cent.
7·2 ...	3·3 ...	2·6 ...	0·1 ...	0·3

TRIPLE INFECTIONS.

Ankylostome, ascaris, bilharzia	Ankylostome, ascaris, trichocephalus	Ankylostome, bilharzia, trichocephalus
2·6 per cent. ...	0·2 per cent. ...	0·06 per cent.

TABLE III.

Village	Ankylostome percentage	Bilharzia percentage
1. Mabuluki	56 per cent. ...	13 per cent.
2. Kasoti	37 ,, ...	7 ,,
3. Kaiyune	27 ,, ...	11 ,,
4. Kanyoli	37 ,, ...	22 ,,
5. Mwahimba ...	46 ,, ...	25 ,,
6. Mwawembe ...	60 ,, ...	8 ,,
7. Mwanjawalo ...	39 ,, ...	26 ,,
8. Mwafilaso	33 ,, ...	24 ,,
9. Mwakasungula ...	37 ,, ...	14 ,,
10. Mwangulukulu ...	50 ,, ...	6 ,,
11. Mpata, Chungu, &c.	40-60 ,, ...	20 ,,
12. Simapoma ...	40 ,, ...	40 ,,
13. Vua	37 ,, ...	—
Henga Valley	24 ,, ...	3 ,,

TABLE IV.

PERCENTAGE IN VARIOUS TRIBES.

Ankonde Per cent.	Awemba Per cent.	Ahenga Per cent.	Swahili Per cent.	Nyachusa Per cent.	Hill Henga Per cent.
38-60 ...	60 ...	37 ...	56 ...	50 ...	24

TABLE V.

Infancy	Childhood	Adult life	Old age
12 per cent.	47 per cent.	51 per cent.	41 per cent.

TABLE VI.

Parasite	Percentage in relation to soil, vegetation, &c.: Lake shore villages	Percentage in relation to soil, vegetation, &c.: Villages a mile or more inland	Percentage in relation to water supply: Lake	Percentage in relation to water supply: Rivers	Percentage in relation to water supply: Wells and water holes
Ankylostome ..	40	48	40	45	53
Bilharzia ..	12	27	12	28	35

TABLE VII (EXCLUSIVE OF CHILDREN.)

Gastro-intestinal exclusive of dysenteric	Dysenteric	Circulatory	Joint pains	Anæmia and one or more of preceding symptoms	Anæmia only	Denying illness, and showing no symptoms to be attributed to ankylostome infection
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
18	3·5	15	7·5	20	27	31·5

TABLE VIII.

Month	Number examined	Percentage infected
June ...	192 ...	40 per cent.
July ...	456 ...	52 ,,
August ...	312 ..	53 ,,
September ...	200 ...	46 ,,
October ...	210 ...	49 ,,

TABLE IX.

	After one course of treatment with beta-naphthol	After one course of treatment with eucalyptus and chloroform mixture
Percentage still showing ova on re-examination	42 per cent.	33 per cent.

TABLE X.

Carriers	Mild cases	Moderate cases	Severe cases
58 per cent.	37 per cent.	4·5 per cent.	0·5 per cent.

TABLE XI.

	General development: Good	General development: Fair	General development: Bad	Percentage of individuals showing one or more of the symptoms detailed below: Circulatory	Anæmia	Gastro-intestinal	Joint pains	Tongue
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Infected ...	70	28	1·5	17	34	20	5	18
Non-infected	68	31	1·0	18	37	11	6	17

TABLE XII (CHILDREN).

	General developments: Good	General developments: Fair	General developments: Bad	Percentage of children showing one or more of the symptoms detailed below: Circulatory	Gastro-intestinal	Anæmia, with or without enlargement of spleen.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent	Per cent.
Infected ...	64	32	4	8	28	58
Non-infected	66	32	2	4	12	62

TABLE XIII.

Enlarged spleen and anæmia Per cent.	Enlarged spleen, no anæmia Per cent.	Spleen normal, anæmia Per cent.	Spleen normal, no anæmia Per cent.
38 ...	21 ...	20 ...	21

ADDENDA.

(1) *Helminthic Disease in Domestic Animals.*

As a matter of interest, various domestic animals have been examined, and a helminth allied to the human ankylostome was found to exist in a large percentage.

Sheep.—Of thirteen sheep from various parts of the district, ankylostome-like ova were found in 51 per cent. These ova differed from the ova of the human ankylostome as follows: larger, slightly more ovoid, with a larger space between capsule and nucleus; segmentation was further advanced than in the human ankylostome.

Cattle.—Very similar ova found in 10 per cent. of ten cattle examined.

Donkeys.—Ova found in 80 per cent. of five donkeys examined. Mature worms from a donkey

are nearly twice the size of the human hookworm, but in essential details very similar. A drawing of the male caudal bursa is shown in the illustrations. While there is no doubt that this helminth is a totally distinct variety from the human hookworm, and no such ova were at any time found in humans examined here, at the same time it is reasonable to consider the possibility of humans becoming infected by it; for if such infection occurred, the difficulties of prophylaxis would, in view of the large number of cattle in this district, be enormously increased.

(2) *Notes on some of the Prevailing Diseases in the North Nyasa District.*

Small-pox.—No cases of small-pox have been seen, nor any outbreak reported. A good many cases of blindness ascribed to small-pox are seen, and one frequently sees natives, adults mostly, bearing the marks of small-pox. A vaccinator is at work in the district, and the natives are keen on being vaccinated.

Pneumonia.—These natives appear able to bear a great deal of exposure without ill-effects, but quickly succumb once they are attacked with pneumonia.

Tetanus.—One fatal case in a woman; no history of previous injury or confinement.

Leprosy.—Several cases, mixed variety, mostly from the north end of the district.

Malaria.—Common. Anopheles mosquitoes are found in all low-lying parts of the district, and the nature of the country is most favourable for their production. The spleen rate for children under 12 is, for the district in general, 60 per cent.

Tick Fever.—The tick, *Ornithodorus moubata*, is found in the Henga Valley and near Fort Hill, and probably occurs in other parts.

Syphilis.—Secondary and tertiary lesions are observed, but no case of primary sore has been seen, probably because the native does not appreciate the need for treatment. There are many forms of dubious ulcer that may be syphilitic, but a definite diagnosis is often difficult.

Yaws.—This disease is fairly common, and typical cases are seen, with definite primary and secondary stages. Iodide of potassium appears to be the most effective drug.

Filariasis.—Most of the cases seen have come from the Songwe River area.

Eye Diseases.—A form of acute catarrhal conjunctivitis is very common here in November and December, and is probably infectious. Interstitial keratitis is often met with. Cataract is hardly ever seen.

Ear.—Otitis is very common in children, and is very possibly a mycosis in many instances.

Digestive.—A severe ulceration of the gums and mucous membrane of the mouth, leading to gangrene in some cases, is fairly frequent. A spirillum and various bacilli are found in the discharge. Various intestinal disturbances are of course common, and though in some cases evidently due to helminthic infection often bear no relation to this, and are probably due to the diet of the native and to drinking polluted water.

Skin.—Scabies and the various tinea are common; eczema, especially in children, and many varieties of ulcer, including ulcus tropicum, ulcerating yaws, specific ulcers, and ulcers due to neglected cuts and scratches.

(3) *Bilharzia Infection.*

This infection, in the intestinal form as a rule, is found in varying percentages all over the district, especially at the lake level, but, unlike ankylostomiasis, it is obviously affected by the nature of the water supply. This is clearly shown in Table VI. Urinary bilharzia was comparatively seldom seen.

An examination of the various water supplies, lake, wells and rivers, failed to reveal anything in the nature of an intermediate host. Two or three varieties of lake and river fish on examination were also negative. An illustration is given of a helminthic parasite, found free or in the folds of the mucous membrane in the intestinal canal of fishes. The body cavity would appear to be one large ovary, and oviposition proceeds at a great rate when this parasite is placed in water, an enormous number of eggs being laid. The symptoms produced by rectal bilharziosis are not as a rule severe in these natives. Dysenteric diarrhœa, of an intermittent form is the usual symptom complained of, and in many cases they deny any symptom. Here again it would appear that there is a relative racial immunity.

FLIES AND DISEASE.

Anti-fly work has not reached the precision which one would desire. The house-fly, as a transmitter of diarrhœal troubles, especially amongst infants during hot weather in cities, is at present regarded with suspicion, and in some instances actual proof of the incrimination has been brought home. The Department of Social Welfare, U.S.A., has endeavoured to show the difference between an area protected from fly infection and one in which no protective measures were attempted. The means adopted to get rid of flies from dwellings are: screens to windows and doors, fly trapping, fly papers, disinfection of breeding places with iron sulphate, clean streets, clean houses, courtyards, yards, and stables. Flies caught in houses and their surface washings plated for bacteriological counts were found to differ, according as these flies were collected from clean or dirty houses, thus: (1) Cultivations on agar from clean houses showed a count of 13,986 to 1,106,017 in dirty houses; whilst (2) cultivations on Conradi plates in clean houses showed 4,489 to 292,117 in dirty houses. The cultivations on Conradi plates indicate fairly accurately the number of intestinal organisms in the surface of the flies.

It is interesting to note that amongst the flies dealt with, such as house-flies, blue-bottles, flesh-flies, &c., the house-fly *Stomoxys calcitrans* formed 1 per cent. of the whole, and as the *S. calcitrans* is considered to be a means of spreading infantile paralysis the prevalence of flies allowed to proceed unrestrained tends to propagate several serious ailments in temperate climates.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 15, 1914.

COWS' MILK.

IF one were to state shortly the geographical distribution of the use of milk it might be summed up by saying that it is used less and less as the equator is approached. The reasons for this are several, but under the heading "climate," in the widest sense, explanations are mostly grouped. In the first place northern pastures are necessary if the cow is to give a profitable supply of milk; and not only so but cattle cannot exist in arid districts where water is scarce and green food at a minimum, or even wholly unobtainable. Even in many parts of the Tropics or sub-Tropics, the earth may be covered with a green verdure, but it has not the sustenance of northern pasture grass and in many instances it is not edible, both cattle and sheep avoiding it. "No suitable food, no good cows' milk," is therefore an axiom readily understood.

Again, even in places where cows exist, their milk is frequently not used as milk pure and simple, but "prepared" in some way for consumption. We know it as cheese and butter; in India ghee is more elaborate in its preparation than our butter made as it is by merely churning fresh cream. In many parts of South-Eastern Europe and in Western Asia, milk is consumed after being submitted to a method recently made known to Western Europe by Professor Metchnikoff. The lacto-bacillus employed is taken from the Bulgarian preparation; besides which there is the "Yaourt" method so largely employed in Western Asia. The "Yaourt" soured milk is placed upon the market by the Société du Yaourt d'Orient Ltd., and is advertised as "Vardy's Curdled Cream," for which advantages over the Bulgarian plan are claimed. These several preparations may have advantages, but they are not cows' milk, only preparations of the same. The reason for advocating these manipulations is usually ascribed to a beneficial agency developed in the milk itself, and various health-giving properties are claimed for the milk thus "doctored." The fact is that all such methods are employed because milk is so speedily changed and soured in hot weather that it becomes undrinkable. This is anticipated by the addition of the lacto-bacillus, be it the Bulgarian or the Yaourt method. The action, moreover, of the lacto-bacillus fermentation tends to kill out other germs such as those of tubercle, typhoid, scarlet fever, &c., which may be present, and the "souring" of the milk therefore is at once a hygienic agent and a convenient preservative.

Milk is so "touchy" a fluid that the possibility of its use in towns in the pure state becomes more difficult as towns increase in size, and milk has to be imported in larger quantities, and the failure of ensuring sweet milk in hot weather is an important matter for the supplier and a serious inconvenience, let alone other drawbacks, to a community.

Preservatives of various kinds are used in most countries. Formalin, boric and salicylic acids, &c., are in vogue to-day and yet others will succeed them in the future.

None of these, however, supply the community with untampered milk, and the addition of bacilli or chemicals is not above suspicion.

Pure milk, therefore, so all important a factor in our food, seems an impossible article to obtain in towns of any size, and a great problem lies before every community. What is the probable and possible solution of this all-important question? Condensed milk, prepared as it is at present, does not and never will give us what we want; it is needless to give the pros and cons for this statement, as they are well known to every one. Pasteurized milk put up in tins and bottles is satisfactory in a way, but it also has many drawbacks, as we know. The solution would seem to lie in the direction of a "dried milk," provided this is carefully prepared and packed. Milk

dried in a scientific way coincides more strongly to theoretical requirements than any other process known to us at present. Of course "dried milk" is not "natural" milk, but whether any essential element of nutrition is lost to the milk, or converted so as to be rendered useless for nutritive purposes by the process of drying, has to be inquired into and these possible detriments removed if such can be accomplished. Dried milk is being used in several directions at present, but the matter wants further investigation before it can be pronounced a success. Something must be done, otherwise milk will largely cease to be used at home and in British over-seas dominions and colonies: a calamity indeed, for the race would suffer in consequence, if it has not already seriously suffered, by the detrimental measures adopted of late years to distribute milk in a "natural form" in Britain.

Dried milk, if it can be proved a satisfactory substitute for natural cows' milk, has theoretically much to recommend it. The bulk is reduced, and, therefore, the carriage being cheapened, milk would be obtainable at a lower price, a most important factor. There is less handling necessary, and instead of being transmitted in big cans for railway carriage, poured into receptacles of doubtful cleanliness, transferred thence to milk jugs, &c., exposed to infection by flies and dust at every turn and during every transmission from vessel to vessel, the packet of dried milk could pass from the farmhouse to the consumer's table without having seen the light of day on the journey. The drying process means the use of heat, the cost of which must be taken into account; and it means also the addition of boiled water, again involving cost for firing. A convenient method by which the process of drying can be carried out it is surely possible to devise, so that the farm kitchen fire can be utilized for the purpose. To require milk to be sent to a collecting or co-operative station to be dried would continue many of the dangers of infection, souring, &c., which prevail at present; and it only requires a little ingenuity to devise an apparatus whereby the farmer can dry the milk in his own house and by the fires in ordinary use. For "board ship" use dried milk would be a great gain, and were its consumption confined to this sphere alone it would have an extensive market

It is certain something has to be done; we cannot continue as at present; and it is surely within the power of man's ability to devise some method whereby cows' milk can be supplied, if not in its natural state, at least in some form which does not negative its nutritive qualities.

One may answer to the whole question, Is milk after all a necessity? In many parts of China and other countries milk is not used at all, and yet nearer home we are accustomed to the French and people of other western European nationalities speaking in derogatory terms of milk and condemning its use, even for children. Diluted red wines are advocated instead, and the English belief in milk for children decried. I do not believe British folk, either at home or abroad, will agree to this doctrine now or in the future. The demand for milk grows, and England is being converted into pasture-lands and the plough, and wheat-growing is neglected, so that the demand of the cities may be met. This demand will not cease in England so long as English pasture-lands remain; for there are no pastures such as we meet with in the British Isles elsewhere in the world and, consequently, there is no milk possessing the high qualities we are accustomed to. This is an important factor to remember, for once dried milk is adopted it can be conveyed to these shores from any part of the world. This fact it is well to bear in mind, for British milk, in whatever form it reaches our homes, has a nutritive value altogether superlative to any produced elsewhere. We understand that several important companies are dealing scientifically with the matter of dried milk in this country and it is to be hoped their efforts may be successful.

Other milks—goats', mares', asses' and buffaloes'—are utilized in many parts of the world, but the dangers of their uses and their unsuitability for human consumption compared with cows' milk are such that these will never prove a substitute for cows' milk so that we cannot look beyond the cow for supplies.

J. C.

THE PRODUCTION OF SENNA IN THE SUDAN.

THE senna exported from Egypt is gathered from shrubs growing wild in the Sudan and the Red Sea littoral of Arabia. The Sudan variety is the *Cassia acutifolia*, which furnishes what is known as *Cassia angustifolia*, which supplies the senna called Mecca, Arabian or Indian. Senna is gathered once a year, in October, the size and quality of the crop depending on the abundance of the rainfall. The leaves and fruit are allowed to dry on the branches. The product is classified in four grades as follows: Whole leaves, half leaves, broken bits, and fruit (bean). Suez is the collecting point for both Sudan and Mecca senna. Arabian statistics are not available, but during the year 1912 senna from the Sudan was exported to the value of nearly £10,000, and in the first half of 1913 to over £6,000.—*Journ. Roy. Soc. Arts*, June 10, 1914.

PARDAH AND EARLY MARRIAGES.

ACCORDING to a Hindu writer, the original cause of the establishment of early marriage and the pardah system among the Hindus was due to the protection of their young females from Mahomedan raiders. The Mahomedans used to raid the various parts of India from time to time, plunder the people, and take away by force the Hindu maiden girls to their own country, convert them into Mahomedanism—by force, of course—and marry them. The Hindus, at that time, in order that their young girls might be spared by the raiders, began to marry their children when they were far too young, for the Mahomedans would generally take away unmarried girls, though many married Hindu women used to meet the same fate. The objectionable conduct of the Mahomedans is also responsible for the evil custom of the pardah system in India.

Annotations.

Aseptic Hypodermic Injections (M. Loiselet, of Beyrouth, *Revue de Médecine et d'Hygiène Tropicales*, vol. xi, No. 1).—The needles are kept in 5 per cent. carbolized liquid paraffin, which prevents rust and does away with flaming which makes the needles blunt and brittle. At the time of injection the needle is taken from the oil, fixed on the syringe, and chloroform is rapidly pumped up and down. The skin is disinfected by placing upon it a drop of tincture of iodine, through which the puncture is made before it has time to spread or evaporate, so that the needle passing through the drop carries in with it some of the iodine solution. After the injection the needle and syringe are cleaned as before in chloroform. The needle is replaced in the carbolized oil and the syringe in its box. Several thousand injections have been thus made, the majority of quinine, without the slightest trouble.

Fulminating Gangrene of the Genitals (Editorial, *Medical Record*, June 20, 1914).—This mysterious affection is usually regarded as a composite of various clinical entities which pursue analogous or identical courses. Now and then we can hardly avoid the conclusion that a true venereal propagation has occurred, while in other cases a simple injury from coitus has become inoculated with a germ of great virulence. The fact that in a recent case of this sort a salvarsan injection terminated the condition suggests that the spirochæte of syphilis, or at least some spirochæte, was the pathogenic agent.

This affection has received a great deal of study at the hands of French writers, and is in fact known by Fournier's name. A very large morbid material has been collected and analysed. It is, therefore, of interest to mention a case recently reported by Löhe before the Society of Physicians of Charité Hospital, Berlin (*Berliner klinische Wochenschrift*, May 4). The patient, a man aged 61, under treatment for a genital affection not named, suddenly developed an enormous swelling of the penis which extended centralwards. The organ was of the size of a man's forearm, while the scrotum swelled to the dimensions of a child's head. Only at a later period did blebs develop, giving exit to a gangrenous fluid. The patient was anæsthetized, and free incisions made, the prepuce being split. In this manner 100 c.c. of the same fluid was evacuated. The patient recovered under a combined surgical and supporting plan of treatment.

The author, like others in the past, seems to regard this affection as practically an erysipelas, in which intense inflammation brings about lymphatic stasis and gangrene. Such a theory hardly accounts for the majority of these cases, for the initial lesions may be gangrenous vesicles. In the present case constitutional disease (diabetes) and urinary infection could be excluded, despite the coincidence of enlarged prostate.

Abstracts.

RECOMMENDATION AS TO SANITATION CONCERNING EMPLOYEES OF THE MINES ON THE RAND MADE TO THE TRANSVAAL CHAMBER OF MINES.*

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THE reports of the Native Affairs Department show that for natives employed in mines and industrial works in the proclaimed Government district of the Transvaal during the year 1903 the death-rate was 71·7 per thousand. This high death-rate has been steadily dropping till the present time. During the year 1912, for about 300,000 employees in the same area, the rate was 26.84. This rate is still very much too high, as we are considering men in the prime of life.

The death-rate among the negro employees working on the Panama Canal during the same year was only 10. Still this drop from 71 per thousand to 26 per thousand in the course of nine years is most encouraging.

Pneumonia varies very greatly in the different mines. It also varies greatly as to the locality from which the natives come. Among natives from the British Nyasaland Protectorate it is highest: among the natives from the Cape Province it is lowest.

PNEUMONIA.

The pneumonia rate varies widely also in different localities. Among natives not working in mines in the city of Johannesburg, the rate was 1·20 per thousand for the year 1912. In the new Goch mine, the rate among natives was 16·71. In the Municipal Location at Klipspruit, the rate among 750 natives over 18 years of age, extending over a period of three years, was 1·37. This is the same class, and also age, as the men in the mines.

For the year 1912 the 21,000 tropical natives had a death-rate from pneumonia of 26.30; but the 199,000 non-tropicals had a rate of 8. In general, the tropical is the non-civilized native who has had little contact with the white man's diseases, and the non-tropical the native who has had more or less contact with civilization — and the white man's diseases.

In general, therefore, a community which has had a large proportion of tropical natives will have a high pneumonia death-rate, and a community with a large proportion of non-tropical natives will have a low pneumonia death-rate.

During the first few years on the Isthmus, we housed our negroes in barracks containing about eighty-four men each, and of such dimensions as to give them about 30 ft. of floor-space. This is ordinarily considered very crowded. In 1907 we allowed our negro labourers to scatter out along the line of the Canal, build each man his hut, with a small cultivable piece of land, and bring over his

* From the *Journal of the American Medical Association*, June 13, 1914.

family. In 1910 our negro force was 37,000. Of this force, only about 7,000 lived in barracks; the other 30,000 lived in their own establishments. To this fact of scattering I attribute the disappearance of epidemic pneumonia. I explain it in this way:—

It is a well-recognized fact in military hygiene that overcrowding of a barrack is coincident with inflammation of the upper respiratory passages, which at times become epidemic. This was the case on the Isthmus of Panama, and doubtless is the case on the Rand. Non-immunes crowded into barracks would in the same manner develop inflammation of the upper respiratory passages, in many cases due to the pneumococcus, which inflammation would afford a portal of entry for the pneumococcus resulting in some persons in lobar pneumonia and in others in a certain amount of immunity. If we have eighty-five men in a crowded barrack, and the pneumococcus gets in, the probabilities of its spreading to the other men are considerable. If the pneumococcus establishes itself in a man living in a hut alone, or with his family, it is not apt to spread to the men with whom he works, and with whom the contact is not intimate. The scattering of our negroes was the chief cause of our sudden and permanent drop in pneumonia on the Isthmus.

Other causes no doubt contribute to it. The next most important, we think, is acquired immunity, such immunity as the old boy would have as compared with the new boy. It is self-evident that the proportion of old boys to the new was much larger in the force in 1909 than it was in 1906.

The question of immunization for pneumonia as recommended by Sir Almroth Wright should be more carefully looked into. It would be useful to continue the experimental inoculation against pneumonia, using the different strains of pneumococci.

Persons recovering, or having recovered, from pneumonia may, and usually do, carry virulent pneumococci in their mouths and respiratory passages for long periods, and may infect others indirectly by means of their sputum, or by infecting the drinking or eating utensils used by several persons in common, or by infecting the common water-tap or cup. It has been observed that natives when drinking from the water-tap place it in their mouths, and in this way may leave a moist film of infected spittle on the tap to be taken up by the next person using the tap. In the mines, one tap has to serve for many labourers on the level, and personal observation has shown the facility with which a line of thirsty natives may become mutually infected.

Not only are pneumococci transferred in this way from persons who have recovered from pneumonia, but it is most probable that pneumococci are acquired similarly from persons suffering from the "common cold," tonsillitis and other forms of inflammatory disease affecting the upper air-passages.

It is highly desirable, therefore, that means should be used to prevent as far as possible such conveyance of infection as is indicated above. This might be done effectively and economically by means of some of the well-known types of "bubbling" fountain, or protected taps. These taps prevent the dissemination not only of pneumonia, but also of tuberculosis and syphilis.

Tuberculosis.

Tuberculosis is far too high among native miners. The report for 1912 shows that the total rate for all native miners was 5·65 per thousand for pulmonary tuberculosis. The rate at Panama, for the same class during the same year, was less than 1 per thousand. The rate for London, total population, men, women, and children, was 1·03 per thousand for 1911, and for New York, 1·67 per thousand for 1911.

In addition to the deaths of natives from pulmonary tuberculosis, there is a high percentage of deaths from other forms of tuberculosis among the native labourers, as tuberculosis of the intestines and abdominal viscera.

The actual number of deaths from tuberculosis for the year 1912 among 156,534 natives is probably a total of 1,702.

This gives a death-rate for tuberculosis in all its forms of 10·87 per thousand per annum, of the average working force of 156,534 natives, so that the death-rate from tuberculosis in all its forms is as a matter of fact considerably higher than 5·65 per thousand for 1912, and 4·80 per thousand for 1913, as shown by the reports supplied by the Chamber of Mines.

Estimating the deaths from tuberculosis we find that in 1910 we had among natives a total of 1,520, which would give a rate of 8·85 per thousand. In 1912 we have a rate of 10·87 per thousand. For the future, present conditions continuing, tuberculosis will cause more trouble among natives than does pneumonia at present.

Overcrowding plays just as important a part in the spread of tuberculosis of types other than pulmonary tuberculosis as it does in the pulmonary type. The same measures for its control are applicable.

Careful routine medical examination should be made of the sick, and when a man is found to have tuberculosis he should be excluded from the mines. As far as the native is concerned, the most important single measure is that recommended for pneumonia, that is, scattering, and in the same way as recommended for pneumonia.

Disinfection in the dwellings of the tuberculous is useful and important, and should always be resorted to.

Tuberculosis is a disease that can be particularly combated by fresh air, sunshine, cleanliness and roomy quarters.

Miners' Phthisis.

This disease has so far been steadily increasing on the Rand. The reports for 1903 show a rate of 0·05 per thousand, and that for 1912 a rate of 0·10 per thousand. The disease is essentially a silicosis, and is caused by particles of silica getting into the lung-tissue, through respired air, causing chronic inflammation, the tissue thickening until finally a considerable portion of the lung is destroyed for respiratory purposes. This condition of the lung brings about a low state of local vitality, so that an

organism like the tubercle bacillus easily finds lodgment. At present on the Rand most persons with miners' phthisis die from an incidental tuberculosis implanted on a silicized lung, rather than from silicosis itself. The hygiene of this disease is obvious, that of laying the dust, so that the particles of silica will not be floated in the air where they can be breathed. Some form of water-spraying apparatus is now very generally used on the Rand. If such measures be generally and carefully enforced and extended, they will soon reduce miners' phthisis to a minimum.

Cerebrospinal Meningitis.

Cerebrospinal meningitis is a disease that at times causes considerable mortality among native miners on the Rand. This is an infectious disease whose organism, so far as we know at present, is spread from person to person by crowding and contact. Scattering would also be the most effective sanitary measure against this disease, in addition to the general measures of cleanliness, air and light already referred to. Disinfection is probably more useful in this disease than in either of the diseases previously discussed.

Typhoid Fever.

During the last four years 310 men on an average died from typhoid fever. Typhoid fever by vaccination is as preventable as is small-pox. This death-rate could be entirely wiped out at once. With the present organized force of medical men it would be neither difficult nor expensive. The vaccination itself causes nothing like the trouble to the person vaccinated as does the vaccination for small-pox. In general, there is almost no reaction, soreness or effect of any kind.

Housing the Native.

The most serious sanitary defect in the mines on the Rand is the manner of housing the native. The quarters are much too crowded. He has in general 200 cubic ft. of air-space, which would give him 14 ft. of floor-space. The general objection is that it causes the respired air to become vitiated. Such crowding forces the occupants into close personal contact, and therefore largely increases the spread of any infectious disease. This applies particularly to pneumonia, tuberculosis and cerobrospinal meningitis.

In the French army they allow about 50 ft. of floor-space to a man. Recently they have largely increased their army, which has caused crowding in their barracks. It is stated in the newspapers that epidemic pneumonia is prevailing among the men, and that the French sanitary authorities attribute the epidemic pneumonia to this overcrowding.

The scattering from large barracks into single huts and small rooms was the important measure in its effects on pneumonia on the Isthmus. For the sanitation of pneumonia I would urge a similar measure on the Rand. Place your negro labourers in individual buildings, and bring in, and place with them, their families. This measure would result with you as it did with us. In the course of about a year it reduced our pneumonia death-rate from 18·40 per thousand to 2 per thousand. It would probably reduce your present rate of 15 per thousand (the highest pneumonia monthly rate for 1913) to 2 per thousand.

What is at once feasible is to extend your family locations. At present all the mines have such a location where the native lives with his women and children. Into these locations the pneumonia rate and the general death-rate are low. They are always among the very best class of native rates on the Rand. At the City Location at Klipspruit, about 2,800 natives, men, women and children, live in neatly constructed single dwellings, more or less separated, from 50 to 200 ft. apart. The whole village, both inside and outside the dwellings, were well policed, and presented a clean and attractive appearance. For the past three years, with an average of 750 male natives over 18 years of age, the pneumonia death-rate had been 1·37 per thousand, while the native rate for pneumonia in the mines on the Rand for the same year (1913) was 10·05.

It is a very striking coincidence that whenever we find the native on the Rand living as he does on the Isthmus of Panama, his health-rates are approximately as good as they are on the Isthmus. When the negro on the Isthmus lived in large barracks, as does the native in general on the Rand, his health-rates were fully as bad as those on the Rand. Wherever I have inquired, the compound manager has told me that he has more applicants for married quarters than he can accommodate, and that if he had more buildings he could fill them. Let each mine therefore put up cheap but comfortable buildings, as they find they have need for them. The native hut strikes me as being excellent. It has a circular wall with thatched roof. In this type of hut, concrete floors and glazed windows I consider quite unnecessary.

At the Arcturus mines these huts were attractive and neat in appearance, complied with the needs of sanitation, and were economical in construction. In extending locations, it would be better, from a sanitary point of view, to erect huts rather than to extend the present buildings.

In extending these locations an eye should be had to the future. They should be laid out in streets and blocks with a view to eventually putting in a water-borne sewerage system.

Eventually, in this way, a considerable portion of the force could be placed in these villages, and the barracks mainly used for the unmarried men. This would begin at once to give more room in the barrack for the highly susceptible new boy. As the barracks ceased to be needed for the unmarried native, they could be slightly rearranged for native married families. This was very satisfactorily done at Panama. As we ceased to need the barracks for our unmarried negro labourer, we transformed them economically into comfortable married quarters.

A native labour force living with families near the mines would be more stable and contented than the present force. They would be old and experienced men and, therefore, more efficient, and from all points of view more economical and satisfactory to the mine manager than the present force.

The economy of this method of housing native labourers might be emphasized by calling attention to the fact that recruiting men costs about $5,000,000 (£1,000,000) per annum. The greater part of this expense can be saved by the construction of locations—such as Klipspruit—or building huts of the general type of those erected by natives at their kraals.

A force of married men living in such a location would be a permanent force of skilled workmen, always available as a source of labour for the mines.

A nominal charge for such huts should be made, such a charge as would pay for the hut, say in ten years, and also keep the huts in repair. Such a location would be self-supporting and would correct the unsatisfactory health conditions of the compounds by giving more floor-space per capita to those who continue to live in them.

Public sentiment will not approve the keeping of a large body of semi-savage labourers in the community in such conditions as obviously to foster sexual crimes. Both the public and the labourer will insist on the native having his women and children. If the labourer cannot have his family with him at the mines, he will, as the country develops, seek other employment where he can have them.

On the order of the Government, recruiting among the tropical natives ceased last March. If we were considering the sanitation of the tropical native alone, I should still more strongly urge scattering, as much as possible, as the proper sanitary measure for him against pneumonia. This dispersion I should bring about, if possible, by putting him in a hut with his family. If this were not possible, I should put him in huts without his family, arranged so as to give him 50 square feet of floor-space. If huts were not possible, I should put him in barracks with the smallest rooms I had, arranged so as to give him 50 square feet of floor-space.

In general, the care of the compound yards showed everywhere neatness, cleanliness and commendable care and discipline; but when we came to examine the interior of the native living-quarters the very opposite was the case.

Food was always present in dirty and unkempt vessels in considerable quantities; old clothing and wearing-apparel of all kinds, soiled and dirty, was littering up everything, and litter of all kinds was stowed away under the sleeping-platforms. I was told that discipline and cleanliness were not enforced in the sleeping-quarters from the fact that the authorities did not wish to interfere with the natives to such a degree as to make them dissatisfied. This is a very good general rule, and a population of the class of the ignorant native miner should not be worried with too many and exacting sanitary regulations. Indeed not much in the way of correction could be done, even if the native co-operated, in the present crowded condition of the barracks. But give each man 50 ft. of floor-space, and he can have an individual bed and box of some kind in which he could keep his personal belongings. It would then be no hardship to require him to keep his belongings to his own bed and in his own box.

If a number of small sheds, inexpensive in construction, and convenient to the sleeping-rooms, were erected around the compound, it would be no great hardship to require him to eat his food under this shed. In the receiving compounds at Johannesburg, the native is required to eat his food on a concrete platform, and no food is allowed in the living rooms; there is no particular objection on the part of the natives.

If the sanitary necessity of keeping the barracks in a cleaner condition was considered, the details could be worked out gradually so as not to interfere to any great extent with the habits and customs of the natives.

A commendable effort is being made generally to correct this condition by cleaning up, taking out refuse, destroying bugs, whitewashing, &c. But this must be done (in the nature of things) very often. In the best-kept quarters this is done about once a month, but in a few days conditions are as bad as ever. It is not feasible to make any considerable improvement in present conditions as long as the barracks are as crowded as they are, and as long as the men are allowed to eat and keep food in their sleeping-quarters.

I recommend that each native be allowed 50 square feet of floor-space; that he be furnished with an individual bed, and an individual box in which to keep his belongings; that the barracks be divided into smaller rooms to contain not more than from twelve to fifteen men; that no food or utensils of any kind be allowed in the dormitories, and that eating-sheds be erected about the compound, located conveniently to the dormitories. A good many of the men at present keep their food from meal to meal and consume it between times. They also use the mealie porridge for making fermented drinks. If it is necessary to allow this, to each native who asked for it, a locker in the eating-shed could be assigned. The expense of such changes would not be large. The increase in floor-space would cause a large expenditure, if the force were as full as it was a year ago. If you encourage your married locations, some room would be gained in the barracks in this way. The reforms could be carried out gradually. Those compounds could first be selected in which the death-rate was high. There are a considerable number of compounds in which the death-rate has been low for a number of years. They are frequently the old compounds which the native prefers, and therefore they contain a larger number of old boys. In all the cases the crowding there was not so great.

These two conditions, namely, the lesser crowding and the greater proportion of old boys, generally explain the better health-rates. In this way gradual improvement could be brought about at no very large yearly outlay.

Diet of the Natives.

The ration is another thing that has impressed me very strongly in inspecting the various mines. I have never seen so large a proportion of the ration supplied by one article as is here supplied by mealie meal.

The two chief components of the daily ration are 2 lb. of mealie meal and $5\frac{5}{16}$ oz. of meat. This is a great deal too large a proportion of the carbohydrates for men doing the hard manual labour that the natives do. The mealie meal might be reduced, and the meat and other articles increased.

A soldier's ration in the British Army is 16 oz. of bread, 12 oz. of meat, and also an allowance of threepence per day for vegetables, and other articles. A miner does very much harder labour than the soldier. His diet should be at least as good.

On the Isthmus we had a great deal of trouble as to rations. There was no particular disease among our labourers that we could attribute to diet, but they seemed to be underfed, and there was constant complaint. The whole matter of food was satisfactorily settled both for the negro and ourselves when the families came and when we established commissaries for the sale of food at cost. The negro then bought what he liked in such quantities as he wished, and his wife cooked it in the manner to which they had been accustomed. At the Premier mine they have three systems of feeding going on at once. The native can either eat his food at the regular mess, buy such cooked food as he liked, or buy food and cook it himself.

At the Kimberley mines the system of food-supply is altogether that of allowing the native to buy his own food. It seemed to be very satisfactory. This would be an excellent system of feeding to adopt generally, although I prefer our system on the Isthmus, where food is supplied the native at cost. The object of this measure is to give him an abundant food-supply in such a way that he can vary it as his tastes suggest. If you attempt to make a profit on food, you by so much defeat the object of your measure.

I am inclined to attribute scurvy to the large amount of mealie meal in the ration. It has been found that beriberi is caused by making polished rice the almost exclusive article of diet. It is due not to the rice itself, but to the fact that the rice is polished. In polishing, the pericarp is rubbed off, and this pericarp contains substances that are necessary in the body economy. Mealie meal, as used on the Rand, has a similar outer coating removed in the process of milling. There is strong evidence to prove that scurvy is due to having such a large proportion of the diet consist of the bolted mealie meal. If this is the case, it can be corrected easily and economically by having the meal properly prepared. This question should be investigated further.

On the Isthmus of Panama in 1906, each man bought his own food from a poorly supplied market, at a very high price, and cooked it himself. In 1908 he bought from a well-stocked market, at cost price, and had someone to prepare his meals.

We first started having each man take care of himself as far as food was concerned. Each labourer bought his uncooked food from the nearest native vender, and cooked it himself between working-hours. This proved very unsatisfactory for several reasons. The labourer did not have time to collect his food and cook it between working hours. He was also too much fatigued to do it properly. Our force increased so rapidly that we consumed everything that there was in the country. We then put up stores along the line, supplying food at cost, and also kitchens where it could be bought cooked at a reasonable price. This proved a distinct improvment over former conditions, but the matter of feeding was put on an entirely satisfactory footing, both to ourselves and to the negroes, by bringing the families over, and allowing each man to put up a hut for himself and his family.

Since that time we have had no trouble as to food for the negro, or dietetic diseases among them. Each negro now gets such food as he likes at cost, and his wife cooks it for him in the manner and quantities which he likes best. Present conditions as to food are entirely agreeable to both parties. The establishment of stores by the commission and selling at low price in no way interfered with opening of stores by private persons. Such stores existed in considerable numbers at all towns and were prosperous.

Sewerage and Water Systems.

Another sanitary improvement completed at about this time was the introduction of sewerage and water systems. One of the prominent causes of death among our predecessors had been dysentery. Indeed, this disease is generally prominent in tropical countries.

Typhoid fever is another disease that we knew we should have to reckon with. In the hope of protecting ourselves against these two diseases we put in eight different water systems along the fifty miles of canal. Generally, for getting water, we dammed the small streams near their source in the mountains, and piped the water down to the cities and villages along the line of the canal. About twenty sewer systems were put in at these villages. The sewerage systems were limited to the villages.

Several things happened about the time of the disappearance of our epidemic of pneumonia.

The men were scattered from crowded barracks to individual huts in the hills, and houses in the towns.

An insufficient, poor, expensive food-supply, badly cooked, was replaced by one abundant in quantity good in quality, cheap, and very well cooked.

Water-supplies and sewerage systems were everywhere installed.

It is an obvious axiom of both hygiene and economy that no unnecessary tax should be placed on the strength of the native labourer. With these objects in view, he should be conveyed to his place of labour, and away from it, with as little delay and as little exertion to himself as possible.

The present bucket system of disposing of night-soil should be replaced by a water-borne system. This is possible everywhere on the Rand above surface. This bucket system promotes the breeding of flies, and the transference of diseased fæcal matter by these insects. The water-borne system would be economical as compared with the present bucket system. Several of the mines have at present partial water-borne systems. I commend particularly that of the Crown mines.

Where a water-borne system is not feasible, a properly constructed, fly-proof closet is preferable to the present bucket system. It is more sanitary and less expensive.

Underground a water-borne system seems to be impracticable from a mechanical point of view. A vault system would be a decided improvement on the present bucket system, both from a sanitary point of view and from the point of view of economy. I mean by a vault system the excavating of a small vault and placing on it a fly-proof seat wherever a closet is needed. I should use no water whatever. Allow only in the vault fæcal matter and urine. When the vault is filled, close the vault and move the seat to a new location, or empty the vault with an odourless excavator. I should empty the vault or move the seat as seemed most convenient and economical. Vaults that were located on the outer workings, and that were to be used less than a year, I should think could be more economically closed than emptied. Vaults that were located near the centre of the workings, and were to be used for several years, might be emptied when filled. This should be determined purely from the point of view of expense.

There would be some sanitary advantage in closing a vault rather than emptying it. I think that from an administrative point of view it would be found more economical to close a vault and build a new one, rather than to empty it. The length of time that a vault would last would be determined by its size.

It has been objected that there would be leakage through cracks in the rock from these vaults into the mine below. There would be so little fluid, the urine only, that I do not believe this would be the case. If the deposit were found to be too fluid, this condition could easily be remedied by the use of dry earth or some similar drying material. I have seen this system used on a large scale in cities with little objection as to odour or inconvenience. The great sanitary objection to the present bucket system is against the daily handling and carrying through the mines of fæcal matter, and the necessary fouling and disagreeable odours that go with such a system. The great sanitary advantage of a vault system in such locations as the mines is that the excreta are permanently disposed of as soon as deposited.

The economical disadvantage of the bucket system lies in the considerable expense of daily transporting the buckets to the surface, emptying, cleaning and returning, as well as the expense of plant. The only expense of the vault system would be that of originally digging the vault and then of closing it.

A system of septic tanks might be considered, if it should be found more economical than the vault. I think that such a system could be planned so that there would be no objection to the effluent passing into the general drainage system.

The Fly Nuisance.

I commend the effort at some of the mines to abate the fly nuisance by trapping and otherwise. All eating-houses, kitchens, dining-rooms, or wherever cooked food, or food, such as fruit, that is eaten uncooked, is exposed, should be well screened as a protection against these insects. In addition traps, fly-paper and such devises as tend to destroy flies that have gained entrance to these places should be used. The present crusade against fly-breeding should be encouraged in every way. Such a movement is one of the best educators.

The disposal of garbage is generally satisfactory. It is in general dumped at some out-of-the-way place sufficiently removed from the mine so that the odours and the flies are not troublesome. I should recommend, however, the general use of crematories. The crematory system is generally more satisfactory than the dump, from the fact that it does away with fly-breeding and disagreeable odours. In many cases it is more economical from the fact that the haul is much shorter in the case of the crematory.

The Liquor Question.

Alcohol for the native is an unmitigated evil. It is in no way necessary for his health; in fact, it is always hurtful. I believe that it would be best for the native on the Rand to have no alcohol at all.

That alcohol is not a necessity for the native is evidenced by the condition of affairs at the De Beers mine. There they have compounds that are kept rigidly closed. Neither kaffir beer nor any other alcohol is given him. Yet he remains in perfectly good health and seems contented. He likes the life at Kimberley better than he does that on the Rand. This is evidenced by the fact that their force is always full, yet they do not have to recruit, whereas on the Rand the opposite is the case.

One cannot see these mines, or look over their statistics, without being struck by the many advantages a closed compound has in the management of these semi-civilized natives.

Medical Service.

Attention should be given to the methods at present in vogue of getting the East Coast boy from his home to the mines. There is opportunity here of the native becoming infected with both pneumonia and tuberculosis before he reaches the mines.

In any case some machinery is needed for carrying out a system of sanitation. On the Rand there are now about fifty-four mines, each entirely independent as to the sanitation and care of the sick. About thirty-eight physicians are employed by these mines. Each is doing the same work as the other. Sixty-two hospitals treat 2,150 patients. None of these hospitals is equipped or manned in a first-class manner. In general, the larger the hospital the better manned and equipped. The nursing force in native hospitals is made up of natives who have neither the intelligence nor training for such work. If a combination could be effected, a much higher state of efficiency could be brought about at no increase of cost. If all the sick could be brought together into one hospital, they could be cared for at less cost than in sixty-two hospitals. You could afford to equip such a hospital with first-class surgical appliances of every kind at

a less cost than the moderate supply at present given to the sixty-two hospitals now in use. The same could be done on the medical side.

In the Bacteriological Institute you already have an institution and *personnel* that could be used for the pathological work, and the patient could be brought to hospital by the railroad, which connects with all the mines, and by motor ambulance and wagons.

With 200 white trained nurses, male and female, in such an institution, you could select your subordinate native nurses from the more intelligent and better educated natives, and thus secure a first-rate nursing force.

In a large hospital of this kind you could keep in better touch with the character of disease affecting the employees, which is in itself a considerable sanitary advantage.

You could select the men best fitted and place them in charge of the sanitary work. These men should devote their whole time to their work, and be in thorough and constant touch with the sanitary conditions of all the mines. One man should be chief, and on the staff of the Chamber of Mines; he should be responsible to the Chamber of Mines, and entirely independent of the management of the individual mines. If you had had for the past few years a sufficient force constantly devoting their whole time and attention to sanitation, you would have by this time reduced pneumonia to a minimum. If it were adopted now, at the end of a few years pneumonia would be reduced to a minimum. If it were feasible to adopt the whole scheme as outlined, which is the scheme that we used at Panama, the results should be the same, the rapid reduction of pneumonia to a minimum. Your native labour force is evidently undergoing a gradual process of immunization. In 1903 and 1904, your total rate from pneumonia was 25·31 per thousand. For the first nine months of 1913 this had fallen to 8·8 per thousand per annum. The fall has been more rapid during the last months of this period, on account of the stoppage of the introduction of the more susceptible native from the tropical regions north of latitude 22. This process will continue going on for several years till the whole of the native labouring population reaches the state of immunity that the Cape native has now. This, I take it, is the maximum that the native is capable of reaching under your present sanitary conditions. This could be still further reduced by the sanitary improvements suggested. I base this opinion on our experience on the Isthmus, where the negroid pneumonia rate has been reduced from 18·74 in 1906 to 0·42 for the first eight months of 1913. During one month in 1906, it was higher than it has ever been on the Rand for a similar body of men, and for a similar period, 43·41 per thousand. Meanwhile, if you introduce the native from the non-immune regions, your rate will go up. This could in great part be prevented by housing the tropical native in huts as suggested, and by furnishing him with cooked or uncooked food to be purchased as he liked. In the course of a year or two he would acquire immunity, and would then be on the same footing as a boy from the South.

Of these sanitary recommendations, that of increasing the floor-space to about 50 ft. is the most important and pressing, and by far the best way of doing this is the village hut system and the introduction of families. If this particular method cannot be carried out, effort should be made to come as near it as feasible.

Second in importance I consider improvement in the hospital system and care of the native sick. This can be best carried out by a central hospital. If a central hospital is not feasible, such concentration of hospitals as is possible should be made.

The third in importance is the establishment of a central sanitary bureau or department under the Chamber of Mines, the head of this department to represent the mines on all sanitary questions.

The present regulations regarding matters of sanitation should be revised so that the sanitation of the mines might be accomplished by the authority of one official, government or municipal, instead of with five different interested parties, as is now the case.

CONTAGION CARRIED BY TEXTILES SUCH AS COTTON, WOOL, RAGS, ETC.

A Refutation.

A WRITER in the *Journal of the Royal Society of Arts* (June 10, 1914) deals with the question of the transmission of disease amongst workers in factories who handle wool, cotton, rags, &c. This much discussed question receives a partial confirmation, but a more complete refutation when the broad outlines of the matter are considered. On the question of the conveyance of small-pox by raw cotton which is believed to have recently occurred it appears that the outbreak of small-pox in a Lancashire mill has been attributed, upon circumstantial evidence, to contagion carried by raw cotton, and the mill-owners have been prevailed on to destroy their stock of cotton-waste. Cotton has been accused in a similar way in at least one other instance, but there has been no proof absolute such as is obtainable in respect of anthrax from wool. English mills use well over 2,000 million pounds of raw cotton annually, and import it from countries where small-pox is always more or less rife. It may therefore be held that were the transmission other than the rarest of occurrences the spread of the disease must have arrested attention long ago. The particular cotton suspected is Mexican, and may actually be a portion of the produce seized by the insurgents, for which the rightful owners have not been paid. In view of the quantities of material involved, and their concentration upon certain centres, the impressive fact about the importation of textile materials is the extreme rarity of cases of infection with any zymotic disease. If one material more than another might be expected to carry disease, that one should be rags, yet the advices from the rag centres are most reassurring. The last published reports from these districts say that zymotic diseases are about the only ones of which rag-sorters never die.

Original Communications.

THE COASTAL CLIMATE OF TROPICAL QUEENSLAND.

METEOROLOGICAL OBSERVATIONS TAKEN AT TOWNSVILLE.

By F. H. TAYLOR and W. J. YOUNG.

From the Australian Institute of Tropical Medicine, Townsville, Australia.

FROM the commencement of April, 1913, daily observations of the local meteorological conditions have been taken at the Australian Institute of Tropical Medicine, Townsville, North Queensland, and the records obtained are summarized in the following tables.

The instruments employed were supplied by the Commonwealth Bureau of Meteorology, Melbourne, and were of the standard pattern in use at the various weather stations throughout Australia.

These observations extending over thirteen months show two distinct seasons, each of six months' duration, the cooler season commencing towards the end of April, and the hotter season towards the end of October. The averages of the temperature records

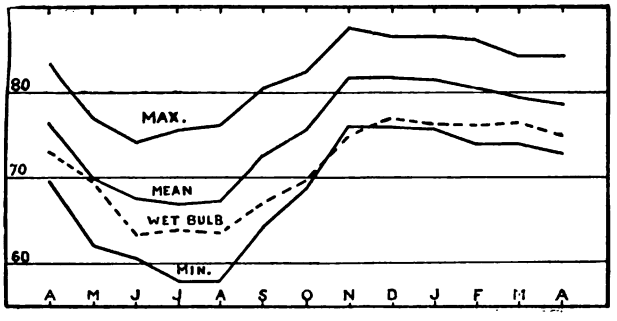


FIG. 1.

during May were markedly lower than those of the previous months, whilst during June and July the temperature still decreased, but the fall was much more gradual. Simultaneously with the fall in temperature the relative humidity of the air showed an analogous decrease, most pronounced between April and May.

The wet season proper finished about the end of April, only light rains occurring in May and June to the extent of 1·64 and 0·54 in. respectively, whilst from July until the middle of December only 0·32 in. were registered.

Between October and November a marked rise was observed in the averages of the readings of the maximum, minimum, wet and dry bulb thermometers. The hot season thus commenced towards the end of October and the high temperature continued from then, with no great variation, until the end of April, 1914. The relative humidity did not rise correspondingly in November, due to the fact that the thunderstorms and rain, which usually occur on the coastal area of North Queensland in October and November, did not commence until December. Only 0·31 and 0·01 in. of rain were recorded in October and November respectively, whereas from the records kept in Townsville for the past forty-two years the average rainfall for these months is 1·39 in. and 1·70 in.

The heavy rains commenced in December, and 45·59 in. were registered from then until the end of April, 1914.

This division into two seasons is readily seen from the accompanying graphs (fig. 1), in which are plotted the means of the average temperature, the maximum, minimum and wet bulb (3 p.m.) readings for each month.

For the sake of comparing the conditions at Townsville with those prevalent in other parts of the tropics where the climate is more generally known, in Table II are given the averages for Townsville for the whole year (May, 1913, to April, 1914), for the two periods of six months corresponding to the two seasons, and the yearly averages for Colombo, Ceylon [1]. For further comparison the temperatures for Bombay [2] are included in the table, since both Bombay and Townsville are situated in monsoon districts where the chief rains occur during the warmer months. It will be observed that during the hot season, November to

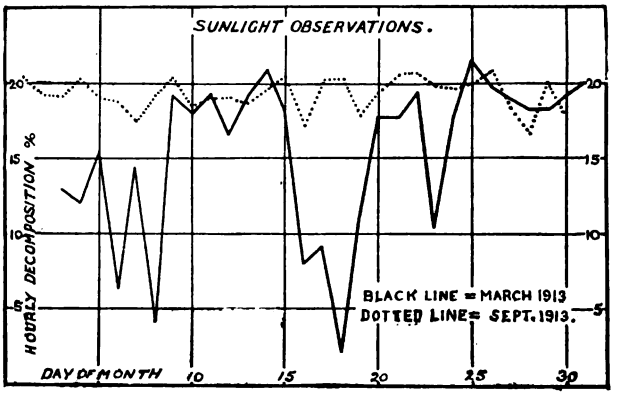


FIG. 2.

April, the meteorological conditions in Townsville are approximate to those which obtain throughout the whole year in Colombo. In Colombo, however, the temperatures do not vary to any great extent; the rainfall is much greater and is distributed over the whole year.

In addition to the foregoing, daily observations were made of the intensity of the sunlight, as regards those rays in the violet and ultra-violet portions of the solar spectrum. The method employed was that recommended by the late Paul Freer, of the Bureau of Science, Manila [3]. This depends upon the photo-catalytic decomposition of oxalic acid into carbon monoxide, carbon dioxide and water in the presence of a uranium salt, a reaction which is brought about solely by the rays in question.

By this method daily determinations are made of the decomposition which takes place in a standard mixture of these substances when exposed in standard vessels to the sunlight during a definite interval, and the figures thus obtained may be compared with those found under identical conditions in other parts of the world.

TABLE I.

	1913 April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	1914 Jan.	Feb.	March	April
Mean dry bulb, 9 a.m. (degrees)	76·6	69·2	66·8	66·9	69·5	75·2	77·7	83·0	82·2	82·4	81·8	80·5	79·9
Mean wet bulb, 9 a.m. (degrees)	70·0	61·6	59·9	60·2	61·2	65·8	68·7	73·3	75·6	75·6	74·5	75·5	74·0
Mean dry bulb, 3 p.m. (degrees)	76·1	75·2	72·5	73·3	73·2	77·5	79·1	84·1	84·6	84·3	84·0	82·4	82·1
Mean wet bulb, 3 p.m. (degrees)	72·9	69·6	63·9	63·9	63·6	66·9	69·4	74·7	76·7	76·1	76·1	76·4	74·9
Mean dry bulb, 6 p.m. (degrees)	76·9	69·8	68·0	68·2	69·2	72·7	75·0	80·1	81·1	81·6	80·5	79·5	78·7
Mean wet bulb, 6 p.m. (degrees)	71·2	63·4	62·2	62·3	62·2	65·9	68·1	73·2	75·4	75·2	74·7	74·9	72·9
Mean maximum ,,	83·2	77·4	74·4	75·8	76·4	80·4	82·2	87·5	86·8	86·8	86·1	84·5	84·3
Mean minimum ,,	73·1	62·0	60·5	57·5	57·5	64·2	68·7	75·4	76·2	75·9	74·4	74·0	72·9
Maximum recorded ,,	88·7	84·2	80·5	78·3	81·7	84·7	88·9	99·5	91·2	91·3	92·3	87·4	86·2
Minimum recorded ,,	65·3	49·7	48·7	46·5	49·0	57·5	61·0	70·1	68·2	71·9	71·0	70·6	68·9
Mean daily range ,,	13·3	15·3	13·9	19·3	18·5	15·7	13·8	12·1	10·7	10·9	11·6	10·5	11·4
Extreme daily range (degrees)	21·0	22·7	25·8	34·9	25·0	26·2	20·8	24·3	17·1	13·8	17·8	15·0	16·1
Extreme monthly range (degrees)	23·4	34·5	31·8	31·8	32·7	27·2	27·9	29·4	23·0	19·4	21·3	16·8	17·3
Mean maximum solar (degrees)	134·5	125·3	120·2	127·9	129·6	136·7	140·8	147·1	146·9	144·0	146·7	140·1	139·2
Total rainfall (inches) ..	7·75	1·64	0·54	—	—	—	0·31	0·01	6·58	14·39	5·61	13·76	5·25
Number of wet days ..	6	7	4	—	—	—	3	1	18	15	13	16	8
Average fall on wet days (inches)	1·29	0·23	0·13	—	—	—	0·10	0·01	0·36	0·96	0·41	0·86	0·67
Greatest fall in 24 hours (inches)	3·96	0·84	0·25	—	—	—	0·19	0·01	1·60	5·53	2·38	2·75	2·35
Mean monthly relative humidity (per cent.)	70·9	63·3	62·8	60·5	60·6	60·2	63·2	64·5	72·6	71·8	70·6	77·7	73·7
Highest daily relative humidity (per cent.)	95·0	95·0	94·0	75·0	80·0	73·0	77·0	79·0	87·0	95·0	86·0	95·0	95·0
Lowest daily relative humidity (per cent.)	51·0	32·0	29·0	45·0	33·0	19·0	41·0	38·0	58·0	57·0	59·0	66·0	67 0

The determinations were carried out under the exact conditions recommended, and the standard flasks used were supplied by the Manila Bureau of Science. Mixtures of 5 c.c. 10 per cent. oxalic acid, 5 c.c. 1 per cent. uranyl acetate and 20 c.c. water were exposed daily from 9 a.m. until noon, and the oxalic acid remaining estimated by titration with standard potassium permanganate.

TABLE II.—COMPARISON OF TOWNSVILLE WITH OTHER TROPICAL PLACES.

	Mean temperature	Maximum	Minimum	Relative humidity
	Degrees	Degrees	Degrees	Per cent.
Townsville (19°8′ S.). yearly average	75·6	81·9	68·3	67·0
Townsville. November to April	80·4	86·0	74·7	72·0
Townsville, May to October	69·8	77·8	61·2	62·0
Colombo, Ceylon (6° 56′ N.). yearly average	81·1	87·1	75·9	81·1
Bombay (18°54′ N.). yearly average	79·4	95·0	61·0	—

On every occasion duplicate determinations were made and the mean figures taken.

The results are embodied in Table III, the figures representing the percentage of oxalic acid decomposed per one hour. As this method only gives a comparative measurement, figures are given in Table IV, which have been obtained in a similar manner in other places, and which have been published in the *Philippine Journal of Science* [4].

TABLE III.—MONTHLY AVERAGE OF THE PERCENTAGE OF OXALIC ACID DECOMPOSED PER 1 HOUR.

Month	Average	Maximum	Minimum	Clear days
1913	Per cent.	Per cent.	Per cent.	
March ..	15·4	21·6	2·1	12 out of 29
April ..	17·8	21.6	4·0	22 ,, 30
May ..	15·8	21·4	2·2	15 ,, 31
June ..	15·4	21·4	4·1	19 ,, 29
July ..	18·4	21·0	15·7	18 ,, 31
August ..	18·2	20·7	12·9	16 ,, 31
September	19·3	20·7	16·8	21 ,, 30
October ..	18·2	21·1	8·5	20 ,, 31
November	18·8	20·9	15·7	18 ,, 30
December ..	18·4	21·2	4·0	12 ,, 29
1914				
January ..	17·5	21·1	2·9	16 ,, 29
February ..	18·8	21·4	8·5	16 ,, 28
March ..	15·8	22·0	3·6	18 ,, 29

In the accompanying graphs (fig. 2) are given the daily variations during two months—one, March, 1913, in the wet season with a low average, and the other, September, 1913, in the dry season with a high average.

These results show that the sunlight in Townsville is extremely rich in these rays. The maximum decomposition, 22 per cent., is higher than any of those

recorded elsewhere, whilst the average is higher than that recorded at Kuala Lumpur, a place almost on the equator. The figures also demonstrate that there is no difference between the hot and cool seasons as regards the maximum intensity, and that the lower averages which are obtained during the hot wet season are really due to the fact that during this time there are a number of days when the sun is obscured by clouds, which results in a low decomposition. The high yearly average is accounted for by the long dry season with its continuous sunny weather.

TABLE IV.—COMPARISON OF THE AVERAGE PERCENTAGE OF OXALIC ACID DECOMPOSED PER HOUR.

Place	Date	Average	Maximum	Minimum	Period
		Per cent.	Per cent.	Per cent.	Months
Townsville, 19° 8′ S.	1913-14	17·5	22·0	2·1	13
Manila, 14° 36′ N.	1910-11	12·4	17·8	1·1	15
Kuala Lumpur, 3° 10′ N.	1911	15·3	18·1	9·0	7
Honolulu, 21° 18′ N.	1911	13·8	20·8	3·5	10
Bagino (Philippines)	1911	14·2	20·6	6·9	4
Khartoum (Soudan), 15° 36′ N.	1911	17·5	20·8	14·8	3
Washington, 38° 59′ N.	1910-11	10·9	19·1	1·7	11

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[1] CASTELLANI and CHALMERS. "Manual of Tropical Medicine," 1913.
[2] HANN. "Handbuch der Klimatologie," 1910.
[3] *Philippine Journal of Science*, 1912, vii, Section B, p. 1.
[4] *Ibid.*

PRELIMINARY NOTES ON ENTAMŒBIASIS.

BY LIM BOON KENG, M.B., C.M.Edin.
Singapore.

AS a result of a systematic examination of the evacuations of all fevers which are not amenable to quinine and are not typical of enteric fever, I have found that infection with the entamœbæ is quite a common disease with a most complex and variable syndrome, entitling it to rank in point of polymorphism along with syphilis. We may call this infection entamœbiasis without qualification, as at present it is not yet possible to say that the general disease is solely due to the *Entamœbæ histolyticæ*.

Entamœbiasic is then an infection of man by any species of pathogenic amœba. So far in my observations the *Entamœbæ histolytica*, or some form closely allied to it, is the cause of symptoms here described.

The primary infection generally occurs by the way of the intestinal canal. It gives rise to the well-known amœbic dysentery as a rule, or it may be located in the biliary passages without giving rise to any intestinal sign or symptom, except gastric irritation in the form of nausea and vomiting and pain in the epigastric region. This hepatic infection is often characterized by an irregular fever which corresponds to that which was described by physicians in India as typho-malarial. This fever, which Rogers clearly recognized, should be called entamœbic fever. It may closely resemble an ague or remittent fever. Under quinine it may even assume a tertian or quartan type, but tends to become remittent. Sometimes it soon shows intestinal signs in the shape of flatulence and diarrhœa, and then is easily mistaken for tropical enteric fever. The urine may show the diazo-reaction, which is not quite typical, inasmuch as the froth is coarse and not pink. The stools are charged with the entamœbæ in one form or another.

Sometimes the hepatic infection is very acute and then we have symptoms of toxæmia characterized by severe urticaria, gastric or hepatic pain, vomiting, choleraic symptoms, collapse, with more or less fever. Until complications set in the pulse is unusually slow (75 to 90 per minute). Both the toxæmia and entamœbic fever may occur without a previous history of dysentery. More rarely multiple abscesses may be the first indication of illness, and as a result there may be developed a distinct form of dermatitis. The abscesses lead to the formation of enormous sinuses and fistulæ in the subcutaneous tissue.

Hepatitis and hepatic abscess is the late manifestation of the entamœbic fever, which may be the primary disease, or which may arise as a sequela of amœbic dysentery. Multiple abscesses may develop under the skin or in the brain or elsewhere.

The protean features of this entamœbic infection may be summarized as follows :—

PRIMARY INFECTION.

Hepatic Passages.—Toxæmia, entamœbic fever, entero-colitis.

Intestinal Canal.—Acute amœbic dysentery.

SECONDARY MANIFESTATIONS (infection spreading from entero-hepatic foci).

Skin Eruptions.—Urticaria, bullous eruption and ulcers, multiple abscesses.

Bronchitis (chronic).

Hepatitis and Hepatic abscess, obscure headaches, neuralgic pains.

Entamœbic Cachexia.—Anæmia, anarsaca, albuminuria, profuse sweats, debility.

Peritonitis, Ascites, Typhlitis (?)

Relapses are very frequent, and one form may pass into another. The primary infection may escape notice altogether. *Death* may result from hyperpyrexia and exhaustion or coma, or from asthenia and cachexia.

Treatment.—The only remedy is emetine chloride by intravenous, intramuscular, or subcutaneous injection. The maximum doses should be given. One grain intramuscularly one to three times a day may be given, and may be repeated until the parasite disappears from the stools. Burroughs Wellcome and Co.'s vapurols have been used throughout.

The emetine chloride given by the mouth, even when keratin coated, gives rise frequently to severe vomiting unless the patient lies in bed and avoids drinking large quantities of fluid.

The entamœbic fever is cured as quickly and effectively as the dysentery. The temperature may come down by crisis with sweating and collapse. With quinine the fever becomes irregular.

Symptomatic treatment for the collateral complications as a result of abscess, anæmia, debility, &c., is always necessary.

Sleeplessness is troublesome. Profuse sweating calls for treatment and is easily amenable to atropine.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 1, 1914.

BRITISH MEDICAL ASSOCIATION.

SECTION OF TROPICAL MEDICINE.

Introductory Address by the President, W. J. Simpson, M.D., F.R.C.P., C.M.G.

A PLEA FOR A WIDER AND MORE ORGANIZED APPLICATION OF SANITARY MEASURES IN THE TROPICS.

GENTLEMEN,—Dr. Williamson, our Secretary, reminds me that the papers to be read are numerous and our time is limited. It will accordingly be necessary that the introductory remarks I propose to make should be few and as concise as possible.

My first duty is to welcome the members of the Section and to hope that we shall have a successful and profitable session.

When considering what I should say on this occasion my thoughts turned to the first meeting of the Section of Tropical Diseases of the British Medical Association held in Edinburgh sixteen years ago, and the great advances in tropical medicine that have taken place since that time. It was a memorable meeting. Sir Patrick Manson, the father of modern tropical medicine, was president of the section and by special invitation he delivered a lecture entitled "An Exposition of the Mosquito Malarial Theory and its Recent Developments." The exposition consisted of two parts: the first was a résumé of Sir Patrick Manson's important observations on the behaviour of the malarial crescent outside the human body and its evolution into sphere and flagellated bodies, and of his own far-reaching deductions drawn from them concerning the nature and probable further development of the parasite in the mosquito based on his former remarkable and original work on the life cycle of filaria in the mosquito; the second part was an account of the brilliant discoveries of Sir Ronald Ross on the development and migrations of the malarial parasite in the mosquito and its transference when mature from the mosquito to another host. Ross's observations and experiments not only proved and established the accuracy of Manson's views concerning the existence of a life-cycle of the malarial parasite in the mosquito, but they also led to the epoch-making discovery that the mosquito by its bite actually transferred to another host the malarial parasite after its life cycle had been completed. Those who were present on that occasion will remember the enthusiasm which ensued when Manson mentioned he had received a telegram from Ross announcing his success in infecting sparrows with proteosoma by having them bitten by mosquitoes which had fed on birds that contained proteosoma and which had been kept a sufficient time for the parasites to pass through their life cycle and find their way to the proboscis of the mosquito. It was felt that the master key had been found to open the door behind which lay revealed the secrets and mysteries hitherto connected with the prevalence and prevention of a widespread and destructive disease, and so it has proved to be.

Time has shown the accuracy of Ross's observations. A new line of research as well as a new method of conveyance of disease was unfolded to the profession by the work of Manson and Ross, which has caused a revolution in our ideas as regards the transmission of protozoal diseases and given a powerful weapon in the hands of sanitarians such as Colonel Gorgas and others in the Tropics to deal with diseases established to be insect borne. It is not too much to say that the world owes a debt of gratitude to Manson and Ross. The immediate effect of their work was that men's minds, which had been occupied since the discoveries of Pasteur, Koch and Lister with the all-absorbing study of bacteria as the causal agents of disease and of the vehicles by which these bacteria were conveyed into the human body, were now diverted to the study of protozoal organisms and the rôle of insects in the dissemination of disease. That study has been exceptionally fruitful and all tropical students are familiar with the great advances and additions to our knowledge that have followed and

which we owe to the labours of Leishman, Bruce, Low, Castellani, Dutton, Daniels, Rogers and a host of other workers. Some of these advances are indicated by the new names that have secured a place in the literature of tropical diseases such as Leishmaniasis, trypanosomiasis and phlebotomus fever.

The interest aroused by the British workers and schools in tropical medicine has created among the medical profession in all parts of the world a greater activity than before in the domain of medical research, and the results are bound to be of the most far-reaching character. Although, with the exception of Sir Alfred Jones and some of the Liverpool merchants, our wealthy men in Great Britain have not awakened to the fact that endowments for the prevention of disease are as important as those for hospitals, and we cannot boast of similar magnificent endowments for scientific research which Rockefeller and other men of wealth have placed at the disposal of Americans for tropical work, yet we live in hopes that encouragement of the same kind may still fall to the lot of our tropical schools and universities. In the meantime the demand for carrying on research work is slowly and partially being met in our own possessions by the establishment of laboratories in India and the colonies staffed by medical officers and other scientists. But the distinction between ordinary routine work required for clinical and public health purposes and that necessary for investigations of new problems which may arise on account of that work or unconnected with it does not seem to be sufficiently recognized. Hence the great danger threatening these laboratories is the swamping of research by ordinary routine work because of an inadequate financial and administrative provision for both classes of investigation.

While a more liberal encouragement of scientific research is advocated, it is necessary not to lose sight of its main purpose, viz., to increase our knowledge in order to assist in the diagnosis, treatment and prevention of disease. There is no risk of the main object being lost sight of in medical practice, but it is not the same as regards applied hygiene, in which it is necessary to beware of laboratory work absorbing attention to the neglect of the adoption of practical measures based on knowledge already at our disposal. Medical knowledge of hygienic value, whether it relates to that vast amount of information acquired before or during the present bacteriological and parasitological era, is not of much value unless applied. We should not be satisfied with its application to the hygienic protection of Europeans in the Tropics. I would put in a plea for a wider and more continuous application of existing knowledge to improve the health conditions of communities in the Tropics and a more scientific and organized service than we now possess to prevent control and suppress disease. Let us at least have a period of scientific and practical application following one of scientific research or, better still, let them go hand in hand.

No doubt many instances can be cited of brilliant results obtained from the practical application of existing knowledge. There is the stamping out of yellow fever in Havana and the Panama Canal, the abolition of malaria in Ismailia, Durban and Clairfond, in the Mauritius, and its reduction and improvement in Panama, Hongkong and many spots and localities in India, Algiers, Italy, West Africa and the Malay States, Egypt and the Sudan. There is the reduction of typhoid fever in the Army in India, and of cholera in some of the Eastern towns. But allowing full credit for these and other achievements and the improvement effected among the small European communities in the Tropics, the fact still remains that comparatively little has been done in the Tropics in this direction. Tuberculosis, cholera, plague, malaria, dysentery, and other tropical diseases over which so much time and labour have been expended on discovering their causation and method of transmission, prevail at one time or another according to the situation of the locality. It is not that they exist because of a want of knowledge as to their prevention, but because well-known preventive measures have not been taken to prevent them.

What do we generally see on a visit to the Tropics in that quarter of the town occupied by the inhabitants for whose welfare we are responsible? Water supplies open to pollution, absence of or defective drainage, nuisances connected with latrines or absence of latrines; rank undergrowth and vegetation close to houses and huts, bad conservancy, and numerous flies, pools, puddles and marsh land breeding mosquitoes, bad housing—which is not so surprising, for it is unfortunately bad at home, both in town and country, among the labouring classes—houses closely built together without order or plan. Many of these housing conditions may be old and represent a period before the causes of disease were understood, but this does not apply to the new ones springing up and rapidly forming unhealthy areas. It is under these conditions that death-rates are high and preventible diseases are rife. Many instances could be given of the need of organized sanitary service to fight against tropical diseases, but I shall content myself with one.

Colonel W. G. King, C.I.E., recently showed that the death-rate in India is more than double that of England, that in 1911 fevers claimed 4,207,000, of which one million (1,000,000) at least may be ascribed to malaria; plague nearly three-quarters of a million (733,000), cholera 354,000, smallpox 58,000, and that in sixty-four large towns the death-rate varied from 30 to 70 per 1,000 of the population, and that the expectation of life at birth of the Indian male is only 22·59 years against 46·04 for English males, or in other words, the Englishman has the expectation of being a citizen at the most useful age for a period of twenty-three and a half years more than the male Indian. The Indian authorities are slowly waking up to this unsatisfactory condition and recently have organized a sanitary service for towns and municipalities which was advocated just twenty years ago. Seven hundred and fifteen municipalities are to have an organized sanitary service. It is a creditable advance, but it is not nearly enough, for it has left out the rural population. It represents provision of a sanitary service for 10 per cent. of the population of India,

while it leaves in a defenceless condition against epidemic and preventible disease the other 90 per cent. A country which has lost eight million deaths from plague in sixteen years must have a better organization than this to protect its people.

THE DIFFERENTIATION OF STREPTOCOCCI.

THE vexed question of the stability of streptococci derived from different sources when cultivated on media containing different carbohydrates and allied substances has been re-studied by C. Floyd and S. B. Wolbach and published in the *Journal of Medical Research*, vol. xxix, No. 3 (new series, vol. xxiv, No. 3), January, 1914. The conclusions these authorities have come to is summed up as follows:—

It is possible to make, more or less arbitrarily, divisions of streptococci from human sources, accordng to their fermentative properties in media containing the test substances selected by Gordon.[1] These properties persist after long cultivation on ordinary media. The agglutination tests and complement fixation tests support the evidence yielded by cultural tests.

Abstracts.

INSOLATION: ITS PROPHYLAXIS AND TREATMENT.[2]

By PAUL G. WOOLLEY.

THE treatment of insolation has been based upon the fact that in that condition too much heat has been produced in the body, and that too little heat is given off; in other words, that the disease is due entirely to heat retention. The whole effort in treatment has therefore been to reduce the temperature of the body by the application of cold, and by encouraging superficial evaporation. But little account has been taken of the fact that in insolation abnormal substances are being produced continuously because of the increased temperature of the body, and that these abnormal products (or products in abnormal amounts) are not being eliminated with sufficient rapidity to insure the body against their deleterious action, the brain and heart being especially affected. Lesions of these organs are the main causes of death.

Insolation (siriasis, sunstroke, heat-stroke, thermic fever) is a term applied to certain symptom complexes, the result of disturbances of heat regulation. These disturbances arise primarily from physical causes—the heat and water content of the air about the body, the condition of the peripheral vascular circulation, &c., but these causes lead to or produce chemical changes in the organism, which are manifested in the characteristic clinical symptoms.

Sunstroke has been attributed to exposure to sunlight, more particularly to exposure of the head to the direct rays. But this does not account for the large group of borderline cases classed as heat exhaustion or prostration, which are encountered among stokers, laundry workers, and persons who are crowded together or who live in hot, badly ventilated, insanitary rooms, buildings, or barracks. Taking the whole series of cases that may be included in a group (represented by the classical hyperpyrexial sunstroke, by the atypical apyrexial heat-stroke, and the heat prostrations which occur in the absence of direct sunlight), insolation may occur under any circumstances in which heat accumulates in the body and in which the body does not rid itself of its metabolic end-products. Since metabolism increases under the influence of abnormal heat, it will appear that symptoms of insolation are imminent whenever the heat production of the body exceeds the heat dissipation, and when, at the same time, the excretory processes are slowed.

Insolation is an auto-intoxication brought about by substances formed in the body under abnormal conditions of heat retention.

Preceding the onset of the symptoms, the body has been losing considerable amounts of water, and at the same time metabolism has been abnormally rapid. The draining off of the water produces a relative concentration of the colloids of the tissues (the protoplasm), and in this state diffusion of metabolites is less rapid than when the colloidal concentration is normal. As diffusion is diminished, the substances which should be carried off in the cellular and body excretions tend to accumulate in the cells and intracellular substance, and tend again to embarrass the cellular activities. It is entirely possible that this embarrassment results in incomplete splitting of certain protein substances, so that instead of the catabolic processes being carried to the physiological limit, they are stopped, in part at least, at a point where the toxic portion of the protein molecule (Vaughan) remains unbroken and active, and so the high temperature of the body, which was primarily produced by external heat, is subsequently caused by protein intoxication. In cases of apyrexial insolation the cause would be an overwhelming production of the toxic fragment of protein which causes collapse. The diminished secretion associated with increased metabolism—which means in terms of physiological chemistry retention of acid products (carbonic acid, lactic acid, &c.), accounts for the fact that the alkalinity of the blood is diminished in insolation. Tissue acidosis helps to account for retention of catabolites, for unless a tissue is giving up water it does not give up its soluble substances, and in the condition of acidosis protoplasm does not give up water, but does the reverse.

Since the body cannot withstand a loss of water of more than 10 per cent. of its weight, an acute loss of 3 to 4 kilos must necessarily result in grave disturbances, collapse, or death. Where losses of water are so great, evaporation is reduced and refrigeration decreased.

[1] M. H. Gordon. Report Local Government Board, London, 1903, p. 85; *Lancet*, 1905, vol. ii, 1400; Report Medical Officer, Local Government Health Board, 1905, p. 972; *Journ. of Path. and Bact.*, January, 1911, xv. No. 3.

[2] From the *New York Medical Journal*, June 13, 1914.

PROPHYLAXIS.

This consists in preventing the accumulation of abnormal amounts of heat in the body. To accomplish this there are mediate and immediate methods. The former applies to habits and clothing, or, in general, to hygienic surroundings at any time, the latter to habits during severe hot weather.

The skin should be kept clean to allow free evaporation; the clothes should be loose and light, moderately absorbent, but thin enough to allow the air to circulate freely and so assist evaporation. The diet should be such as not to create unnecessary demands upon the system. Alcoholic drinks should be tabooed; plenty of cool water or mild citrous drinks may be indulged in to advantage, since they serve to keep the excretory system freely open and to encourage refrigeration by evaporation. Fatigue, worry, anxiety should be avoided as far as is possible. Heavy work in the open should not be done, and even in the shade it should be limited. Dwelling houses and living rooms should be open, and the windows should be shaded in such a way as to exclude the heat rays without cutting off what breezes may blow. Fans, of any sort, are often indispensable, and cool (not cold) baths are infinitely refreshing as well as useful in keeping the body at ease.

During times of intense heat, and always during the hot hours of the day, all physical effort should be reduced to an absolute minimum. At such times rest in the shade, with as little clothing as circumstances permit, should be indulged in. The Oriental custom of taking a siesta in the middle of the day is highly commendable. In addition, it is advisable to suggest a light diet accompanied by as much water as can be gratefully consumed. Such a régime will result in quiet of mind and body and encourage a useful, moderate degree of perspiration and evaporation which results in a comparatively mild state of refrigeration. Attention should be paid to the excretory organs. Citrous drinks encourage the renal activities and so assist in the cleansing of the tissues. Much water will assist intestinal elimination and so assist in preventing intoxication from fæcal stasis. Constipation must be avoided with as great care as diarrhœa. Any exposure to the direct sunlight should be avoided as much as possible, and when such exposure is necessary it should be brief. An umbrella is a valuable protection.

TREATMENT.

One cannot expect to remove extravasations of blood in the brain or meninges in a few minutes or hours, and still less can one expect to restore the damage produced by the hæmorrhages in less than a very considerable time.

Often residual symptoms remain, such as a tendency to relapses, to headache, to partial loss of memory, to loss of sustained attention, to polyuria, even to glycosuria. There is the further possibility that insolation, particularly the moderately severe type, predisposes to meningitis.

Treatment of an attack of insolation is therefore one that combines refrigeration with elimination, both active enough to produce good effects, without embarrassing organs, such as the heart, which are already damaged. To accomplish the former the practice is to give ice-cold packs or baths. To compass the latter recourse is commonly had to stimulants. This latter seems not to be best, except as a last resort. Stimulation of an already burdened organ can do little good and much damage. Hydrotherapeutic methods are of more value in insolation than drugs. Ice-packs or iced baths have a great value, but should not be continued for more than a few minutes at a time and should be discontinued when the rectal temperature has reached 104° F. To replace the water lost to the body before the attack, and to increase elimination, there is no better method than infusion of saline solutions. If it is true that the oxygen content of the body is low and the acid content high, then such solutions should be alkaline. Alkaline solutions are extremely efficacious whether given by rectum or intravenously, in neutralizing the acids of the body and increasing water elimination by the kidneys. The following solution for rectal use should be prepared as follows:

Sodium chloride	80 grm.
Sodium carbonate[1] (crystallized) ..	20 ,,

[1] For intravenous use the alkaline solution should be very carefully prepared. The carbonate cannot be boiled. The salt solution should therefore be made and sterilized, after which the crystals of carbonate may be added. *If the crystallized sodium carbonate is not available and use must be made of the ordinary dried form of the salt, the amount indicated in the prescription given above should be divided by three.*

Water	1,000 c.c.

The injection should be given slowly enough to allow retention. The time consumed in injecting a litre should not be less than one hour.

For intravenous injection the following solution may be used:—

Sodium chloride	14 grm.
Sodium carbonate (crystallized) ..	10 ,,
Water	1,000 c.c.

This also should be given very slowly.

The effect of these solutions upon the secretion of urine is remarkable, and as a rule they will make it unnecessary to use digitalis. When this latter drug is used, it should be very carefully administered and its effects carefully watched. The use of strychnine is not advised in the active stage of the disease.

Such treatment will dispose of the immediate danger, and when this has been done treatment is symptomatic. Headache may be treated with acetanilid, phenacetin, salicylates. But these drugs should be used with extreme caution. This is particularly true of the coal-tar products. Sleeplessness may be controlled with bromides, trional, or other mild sedatives and soporifics.

In apyrexial heat exhaustion external hydrotherapeutic measures are uncalled for, and treatment should be eliminative and stimulative. The internal hydrotherapeutic methods should be very useful in these cases and should be combined with friction, massage, warm packs with sufficient internal stimulant medication.

After recovery from an attack of insolation great caution must be observed by the patient to prevent

recurrences from subsequent exposures to heat. He must pay careful attention to prophylactic measures, and use the greatest precautions in ordering his life. It is advisable for all such persons to arrange their time in such a way that they may spend the hot seasons at some great altitude or cool summer resort. Many tropical countries have what is known as a "summer capital," to which many people go to escape the heat of the lowlands.

THE CAUSATION, PREVENTION, AND CURE OF GOITRE, ENDEMIC AND EXOPHTHALMIC.[1]

By Rupert Farrant.

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Toxæmias can be divided into three groups according to their action on the thyroid. In the first group are those that have no effect on the gland; in the second those that cause a colloid hyperplasia; and in the third those that cause a complete or acute hyperplasia. The microscopical appearances of the colloid hyperplasia are indistinguishable from those seen in exophthalmic goitre. No definite signs of hyperthyroidism are observed in cases affected with a single toxæmia. Neither are they seen in guinea-pigs after inoculation with two acute toxæmias—the second being injected before recovery was complete from the first. But hyperthyroidism, as judged by the occurrence of exophthalmos, was found in a man in whom an acute toxæmia had supervened on a chronic. The case was one in which miliary tuberculosis had developed on a chronic. It was also found when a subacute toxæmia had supervened on a chronic. Ten out of twelve cases of cirrhosis of the liver presented exophthalmos. It had also been described in chronic interstitial nephritis, which may be regarded as a chronic toxæmia liable to exacerbations. As death occurred in these cases soon after the occurrence of hyperthyroidism, a complete picture was obtained of the toxæmias causing extreme thyroid hyperplasia and the thyroid hyperplasia causing signs of hyperthyroidism.

These examples serve to bridge over the gap between the thyroid changes found *post mortem* and the thyroid changes and hyperthyroidism found clinically in either endemic or exophthalmic goitre.

The object of this paper is to record observations made on 85 cases of goitre (exclusive of simple hyperthyroidism) between 1909 and 1914 as to the relationship between toxæmias and diseases of the thyroid; to prove that cases in which the thyroid is diseased, the causatory micro-organism or toxæmia can be determined; to show that in this way not only can diseases of the thyroid be cured, but also prevented.

Causation.

It is proposed, for the sake of convenience, to subdivide the micro-organisms and toxæmias into four groups, according to their situation: they are usually in the mouth, nose, lung, or intestine.

[1] From the *British Medical Journal*, July 18, 1914.

The Mouth.

Pyorrhœa and dental caries are associated with micro-organisms of all kinds; some, such as the streptococcus, staphylococcus, and pneumococcus, can at once be eliminated, as they have no effect upon the thyroid. Any change must, then, necessarily be determined by some other infection. Observations were made at Mr. Landon Whitehouse's dental clinic in 1901 on cases that attended for teeth extraction. Signs of hyperthyroidism were found in about 7 per cent. of cases. Bacteriological examination of the teeth was made in too small a number for the causatory organisms to be determined. The cases were mostly females between the ages of 17 and 30. The history given was that of nervousness, with falling out of the hair and moistness of the palms of the hands, slight loss of weight. Examination revealed a fine moist skin, fine glistening hair, tremor, tachycardia of about 110, perhaps slight prominence of one or both eyes, with or without general fulness or enlargement of the thyroid. No one of these signs was sufficiently prominent for any gross thyroid lesion to be suspected, but taken together they showed a typical picture of hyperthyroidism. Cases of dental caries frequently do not attend until they are suffering from one of the secondary results, as chlorosis, dyspepsia, or osteo-arthritis. Observations were therefore extended to such cases. An exactly similar condition was found in a few of the early cases of dyspepsia, in a large proportion of the early cases of osteo-arthritis, and in some cases of chlorosis.

This association of hyperthyroidism and chlorosis was first described by Chvostek; he thought it was a *forme fruste* of exophthalmic goitre. The symptoms of hyperthyroidism in these cases pass unnoticed, as they are masked by the other more prominent effects of the toxæmia. There is one exception, that is, when the case comes to the ophthalmic surgeon with unilateral exophthalmos. Any one of the symptoms of hyperthyroidism may become more prominent than the others. It may affect the hair, skin, vasomotor or central nervous symptom; the cases being diagnosed and treated for this one symptom, thus alopecia, hyperidrosis, urticaria scripta, tachycardia, and hysteria. Examination has shown that in some of the cases so affected the other signs of hyperthyroidism are to be found.

Case 1.—M. L., female, aged 33. A case with carious teeth, pyorrhœa, dyspepsia, and commencing pains in her joints associated with hyperthyroidism, the most prominent symptom of which was unilateral exophthalmos. There was some slight fulness of the thyroid.

The exophthalmos diminished after ten weeks; no treatment or drug of any kind was given, and she continued her work.

The relation between the pyorrhœa and hyperthyroidism is not merely a coincidence, but is that of cause and effect, as the following shows. After teeth extraction, for the first week there is some increase of symptoms; they then rapidly clear up for two or three months, but it is usually six months before they disappear entirely.

Case 2.—M. W., female, aged 32. A similar case, but with slight bilateral exophthalmos; refused to have her teeth removed. She was treated for one year with the following drugs: Iron, arsenic, nux vomica, belladonna, and aloin, without improvement. Her teeth were then put in order; the hyperthyroidism disappeared in six weeks.

An attempt was made to follow these cases over a period of five years—letters were written to ten cases, no answers were received from nine whose teeth had been removed; the tenth, who had refused to have her teeth removed, came up for examination; the signs of hyperthyroidism had increased, she had unilateral exophthalmos, marked tremor, and a pulse of 120.

The occurrence of some nervous shock causes an exacerbation of the symptoms, especially those connected with the nervous system.

Case 3.—M. M., female, aged 23. Carious teeth, dyspepsia (for which gastro-jejunostomy had been performed, associated with hyperthyroidism). Her teeth were removed, but her father died a few days later, and she developed typical exophthalmic goitre. This subsided in a few months. She then nursed her brother, who died, and she again developed exophthalmic goitre, which again subsided after some months.

A second toxæmia acting on a gland that is already in a condition of complete hyperplasia from infection of the teeth causes an enlargement of the gland, with an exacerbation of the symptoms, the degree of which varies with the intensity and duration of the toxæmia. The symptoms may continue for one to two months after the infection has to all appearances ceased.

Case 4.—A. L., male, aged 30. He had had bad teeth since a child, a persistent cough three years, with slight hæmoptysis two years ago. Eighteen months ago he had had a bad attack of influenza. He stated that he had always been nervous; he first noticed palpitation two to three years ago. Following the influenza his eyes became prominent, he lost weight, and became weak and tremulous. Examination revealed acute exophthalmic goitre accompanied by sleeplessness, delirium and mania, persistent vomiting, and diarrhœa. Amyotonia was so marked that it was first thought to be a case of myasthenia gravis. His mouth was foul from pyorrhœa; the nasal septum was deviated, but there was no evidence of tuberculosis.

In this case the effect of toxæmias on the thyroid appeared to be, from the history, that the pyorrhœa organism caused a condition of hyperthyroidism. The deviated septum rendered him liable to recurring nasal infection: the intermittent toxæmia from this (? *Bacillus catarrhalis*) caused a further thyroid change; the last acute attack of this toxœmia led to the development of exophthalmic goitre. The later history of this patient will be noted under the heading "Cure."

The Nose and Nasal Sinuses.

The nose is one of the sites for acute, subacute, and chronic infections. Amongst the micrc-organisms that cause them are: *B. catarrhalis*, Friedländer's bacillus, *B. influenzæ*, pneumococcus, staphylococcus, streptococcus. Of these, the last three can be eliminated. Of the others *B. catarrhalis* was found from inoculation of guinea-pigs to cause a complete hyperplasia. The rest were not so injected, but as they nearly always occur in symbiotic combination with *B. catarrhalis* these infections may be regarded as having such an action—if not from their own power, from the fact that *B. catarrhalis* is present.

In a normal nose in a normal individual an infection with a common or "influenzal" cold would cause a transient thyroid hyperplasia. The gland would involute to normal soon after the subsidence of the toxæmia. But if the patient were already in a condition of hyperthyroidism from any other cause the fresh stimulus from the *B. catarrhalis* would lead to an exacerbation of the hyperthyroidism. The nose may be abnormal, there may be some deformity leading to chronic infection and thickening or atrophy of the mucous membrane, polypi may be present, or chronic sinusitis—conditions likely to cause a chronic or constantly recurring toxæmia. In these, if *B. catarrhalis* was present, thyroid hyperplasia with hyperthyroidism would occur, as has just been described in cases of pyorrhœa. It, however, should be remembered that the nose is generally sterile, and that an original infecting micro-organism frequently dies out in the presence of an excessive number of pyogenic organisms.

The association of exophthalmic goitre with nasal infections has been described by Hack, Semon, and Scanes Spicer.

The following examples serve to illustrate the occurrence of hyperthyroidism and exophthalmic goitre from these causes:

Case 5.—F. H., male, aged 24. Thirteen months ago was quite well, and weighed over 12 st.; four months later he noticed an enlargement of his neck and other symptoms of exophthalmic goitre; these steadily increased despite all drugs and antithyroid treatment. On admission to hospital he weighed 7 st. 4 lb.

For some years he had drunk water from a goitre-producing well without noticing any thyroid enlargement. Thirteen months ago he began to work with lime, the dust from which caused a chronic nasal irritation. Examination showed that he had ulceration of the middle turbinals with opacity of his antra. There was only a slight nasal discharge, a swab from which showed no growth on culture. An extension of his infection occurred with pharyngitis, laryngitis, and some crepitations at his right apex. He lost 9 lb. in eight days and died. A *post-mortem* examination was refused. Thyroid hyperplasia was caused by the well water, and the exophthalmic goitre from the fresh toxæmia acting upon this.

Case 6.—M. J., female, aged 36. Three years ago the symptoms of hyperthyroidism had developed with exophthalmos. Her neck enlarged six months ago, and she lost 14 lb. in weight. She stated that she had had bad teeth for some years, and a chronic nasal discharge. Examination showed a mild type

of exophthalmic goitre associated with pyorrhœa and chronic rhinitis, with perforation of the septal cartilage. Hyperthyroidism was caused by the teeth infection and exophthalmic goitre by the sequence of a chronic nasal infection.

Case 7.—M. B., female, aged 31. For eighteen months she had noticed the gradual onset of the symptoms of exophthalmic goitre. She had had bad teeth for some years, and constantly recurring colds. Examination showed pyorrhœa, a deflected nasal septum, with chronic hypertrophic rhinitis.

Case 8.—M. C., female, aged 39. A case of similar nature, but exophthalmic goitre developed after chronic sinusitis.

Lung.

The common infection found in the lung is that due to *B. tuberculosis*. Its action on the thyroid varies with the degree of the infection; miliary tuberculosis causes a complete hyperplasia, whilst the chronic causes a colloid hyperplasia. The thyroid changes occurring in a case of tuberculosis can be arranged in a circle which passes through the stages of both complete and colloid hyperplasia to a final condition of fibrosis. The diameter of this circle is dependent on the extent of the infection. At one stage tuberculosis is associated with complete hyperplasia, during which stage signs of hyperthyroidism may become evident.

The onset of exophthalmos has been described following the onset of miliary on chronic tuberculosis, and the condition of the thyroid ratified *post-mortem*.

The following examples serve to illustrate these points clinically:—

Case 9.—C. F., male, aged 39. Had early chronic phthisis; exophthalmos was noted temporarily following the development of fresh foci.

Case 10.—F. S., female, aged 22. Developed whooping-cough two years previously, which was followed by phthisis, which was said to have been cured. Latterly she had noticed a fulness of her neck, which she thought was getting bigger. Examination showed that there was tenderness and slight enlargement of the thyroid. Pyorrhœa was present, aud signs of tuberculosis at the right apex, with tubercle bacilli present in the sputum.

Case 11.—B. S., female, aged 43. Presented a mild type of exophthalmic goitre, associated with pyorrhœa and chronic phthisis. From her history she appeared to have developed symptoms of hyperthyroidism from pyorrhœa, the supervention of phthisis caused an exacerbation which gradually developed into exophthalmic goitre.

Intestine.

The intestine may be the site of all kinds of micro-organisms, and be the medium through which various poisons are absorbed. The toxic products may be divided into two main groups—(*a*) material derived from the decomposition of the intestinal contents from the action of the putrefactive anaerobes: (*b*) toxins directly derived from the micro-organisms infecting the tract.

(*a*) Decomposition of the intestinal contents occurs especially when any obstruction is present in the tract. A toxæmia becomes evident in cases of either acute or chronic intestinal obstruction and in the more subtle cases of intestinal stasis. Observations made on the thyroids obtained *post-mortem* from cases of acute and chronic intestinal obstruction have revealed no signs of hyperplasia. Neither has hyperthyroidism been observed in cases of intestinal stasis, nor have cases of hyperthyroidism shown signs of intestinal stasis, in fact the reverse—frequent action of the bowels or diarrhœa—is a common symptom. Many thyroids have been obtained from cases in which intestinal stasis was present. It is concluded that there is no evidence to show that products of the intestinal putrefaction have any action on the thyroid.

(*b*) The micro-organisms infecting the intestinal tract. McCarrison has shown that some organism living in the alimentary canal of an infected individual gives rise to thyroid enlargement. He produced goitre in goats by giving them water contaminated with the fæces of goitrous people and by feeding them with cultures of the organisms grown on agar. He obtained the same results by using the fæces of non-goitrous people.

The Micro-organisms present in Fæces.

The micro-organisms may be divided into two groups, the aerobic and the anaerobic. The true anaerobic have not been examined beyond the *B. aërogenes capsulatus*, which appears to have no action on the thyroid.

Of the aerobic, the pneumococcus, streptococcus, and staphylococcus can be eliminated as having no action on the gland. There is left the *typho-coli* series, which may be subdivided into the *B. typhosus*, *B. enteritidis*, and the *B. coli* groups. It is proposed to trace these from the *B. typhosus* towards the *B. coli*. Infection with *B. typhosus* does not cause a thyroid hyperplasia. The result of infection with *B. alcaligenes* has not been examined. *B. dysenteriæ* causes a complete or acute hyperplasia, judged from the effect of inoculation of Flexner's and Shiga's bacilli into guinea-pigs and from asylum dysentery in man. Of the *enteritidis* group, Gaertner's bacillus, as found in infantile diarrhœa, causes a complete hyperplasia. These two groups can be dismissed as being causatory agents in the production of endemic goitre, as they are not present in the fæces of goitrous individuals. It is possible to conceive, however, that when they are present in combination with other micro-organisms, they might be concerned in causing thyroid changes and hyperthyroidism. The *B. coli* group is still left. Typical *B. coli* can be eliminated, as it is a normal inhabitant of the intestinal tract of normal individuals.

The Effect of Water on the Coli Group.

A good deal of discussion has arisen as to what is a normal *B. coli*. In this work the normal *B. coli* is regarded as being one that is a Gram-negative, feebly motile, non-spore-bearing bacillus, that coagulates and acidifies milk and produces indol; that forms

acid and gas from glucose, lactose, dulcite, maltose, and mannite, but not from sucrose.

A bacteriological examination is needed of the water supply in goitrous districts, and an examination of the fæces of goitrous persons coming from these districts. The presence of the mutants of *B. coli* in either would suggest that *B. coli* had somewhere been placed under abnormal conditions.

Etiology of Endemic Goitre.

It is proposed now to consider the etiology of endemic goitre from the point of view of infection with the *B. coli* group.

The number of cases among people who have always lived in London is small. It appears that goitre rapidly diminished in London after the closure of the wells and the establishment of a pure water supply. Still London has an advantage that the cases seen come from all over the world. Those examined have come from places as far apart as Cashmere, Central India, Australia, South and West Africa, and various parts of England. The character of the water supplied to these individuals has varied from 48 per cent. of hardness to snow or rain water, The strata over which it has flowed has varied from chalk, granite, clay, and limestone. One can eliminate both the chemical constituents and the soil as being direct causatory agents of endemic goitre.

Contamination of Water and its consideration as a Culture Medium.

Goitre is common in the valleys of mountainous districts. Inquiry shows that the water supply in these districts is of surface origin, and so liable to surface pollution. Usually it neither passes through filtering beds nor stands in volume. These two great safeguards in the removal of surface contamination and its consequent micro-organisms are absent. The same applies to surface wells and springs. Rain-water, though in the first instance pure, soon reeks with micro-organisms from the methods adopted in its collection, and the barrels and tanks in which it is kept. Water derived from snow is also open to surface contamination, and micro-organisms survive longer in water at lower than higher temperatures. Thus in all these instances inquiry shows that there are factors present which render the water liable to contamination, and that they may also tend to the development of or the prolongation of the life of micro-organisms derived from such contamination.

Examination of Fæces.

Fæces of Goitrous Patients.—Bacteriological examination of the fæces of cases of endemic goitre have been made. One case had left the goitrous district nine years.

It may be said that water containing members of the *B. coli* group has been supplied to individuals; these individuals became goitrous, and mutants of *B. coli* have been isolated from their fæces. The mutants found in the fæces were not necessarily the same as those found in the water.

If there is any causatory relation between infection with atypical members of the *B. coli* group and goitre formation, it should be possible to experimentally make an exact reproduction of the series of events. Evidence might also be forthcoming that the organism is specific to the individual in whose fæces it occurred.

Fixation of the Complement.

Blood has been examined for fixation of the complement in three cases of endemic goitre. It was found that there was no fixation of the complement.

This was only to be expected, as the condition is an apyrexial toxæmia. No confirmation can be derived from the complement fixation test.

Pathogenicity and Action on the Thyroid of Typical and Atypical B. coli.

Guinea-pigs were used in these experiments, as *B. coli* is a normal inhabitant of the guinea-pig intestine.

Septicæmia.

Guinea-pigs received intraperitoneal inoculation with typical *B. coli* and with *B. coliformis* to cause a septicæmia. The thyroids showed an acute hæmorrhagic hyperplasia.

Toxæmia Subacute.

Guinea-pigs were fed with bread and milk contaminated with fresh cultures of typical *B. coli*, *B. paracoli*, and *B. coliformis*. Those that survived the longest showed the colloid hyperplasia indistinguishable from that seen in endemic goitre. The glands appeared enlarged, but as they are small in guinea-pigs no reliable observations on this point can be made.

Chronic Toxæmia.

A similar number of guinea-pigs were fed in an exactly similar manner, except that they received smaller doses of the cultures given every alternate day.

It is concluded that these micro-organisms are pathogenic to guinea-pigs in the following order: *paracoli*, *coliformis*, and *coli*. An acute toxæmia, either from intraperitoneal inoculation or by feeding with large doses of broth cultures, causes the thyroid to undergo a complete hyperplasia A chronic toxæmia causes a change similar, both microscopically and macroscopically, to endemic goitre, which is most marked with *B. coliformis*. Endemic goitre can be artificially induced in guinea-pigs. The complete cycle, commencing with water contamination, and the presence of the mutants of *B. coli* to goitre formation, can be performed in the laboratory.

It is concluded that endemic goitre, whether it occurs in isolated habitations or in goitrous districts, is caused in man by the chronic ingestion of organisms of the *B. coli* group.

B. coli are washed away from surface droppings and contaminate surface waters, and they become ingested by man. The coli, being placed under abnormal conditions, either in the water or in the upper part of the intestinal tract, undergo mutation. The mutants

are present in the fæces of individuals affected with endemic goitre, and when once lodged there may remain for many years. The pathogenicity of the mutants appears to vary; some members cause a colloid hyperplasia of the thyroid with enlargement and no signs of hyperthyroidism. It is possible to conceive that some of the varieties may produce a toxin capable of further stimulating the thyroid to a condition of complete hyperplasia accompanied by signs of hyperthyroidism. At present no further attempt has been made to separate them, as there are some hundred varieties. The amount of thyroid change varies with the degree of infection.

The following may be taken as an example of the induction of endemic goitre:—

Case 12.—G. F., female, aged 13. At the age of 10 she went to reside in a goitre district and drank well water for seven months. She then returned tc London; eighteen months later she noticed an enlargement of her neck. She was seen a year later and found to have a general enlargement of the thyroid with an adenoma of the right lobe. The mutants isolated from the fæces had negative reactions to litmus milk, lactose, sucrose, and dulcite.

The Effect of other Toxæmias acting on a Thyroid already in a condition of Endemic Goitre.

Pyorrhœa.—The thyroids in cases in which pyorrhœa coexisted with endemic goitre were softer and more vascular than that seen in endemic goitre alone. Signs of hyperthyroidism were present up to a *forme fruste* of exophthalmic goitre.

Case 13. *B. catarrhalis.*—M. W., female, aged 12. Had drunk water from a well and developed goitre, as had her grandmother and sister. *B. coliformis* was isolated from her fæces. She had a deviated septum and was constantly catching colds. The thyroid was soft and evenly enlarged, and there were some signs of hyperthyroidism. Whilst under observation she caught several colds. After each of these there was an exacerbation of the symptoms of thyroid excess, which subsided about a month after each attack.

Case 14. *An Acute and a Chronic Toxæmia supervening on Endemic Goitre.*—C. G., female, aged 39. Resided in a goitre district in the Himalayas from the age of 18 to 31. Her teeth were removed for caries when she was 32. She developed whooping-cough when 36½. Her neck enlarged about the age of 30, accompanied with slight symptoms of hyperthyroidism. After whooping-cough the hyperthyroidisms increased and she developed exophthalmic goitre. Seen a year later, the thyroid presented an adenoma of the right lobe and isthmus, the symptoms of exophthalmic goitre had largely subsided, pulse 96. In this case endemic goitre caused an enlargement of the thyroid; the pyorrhœa, slight hyperthyroidism; the temporary acute toxæmia of whooping-cough caused exophthalmic goitre, which gradually subsided after its termination.

In a similar way other toxæmias or combination of toxæmias can be considered, the chronic toxæmias causing a colloid hyperplasia and the subacute a complete hyperplasia with signs of excessive secretion. Thus small encapsulated adenomata were found in a case of actinomycosis seven months after infection. An adenoma occurred in one case a year after the combination of rheumatic fever and mumps.

Formation of Adenomata.

Colloid hyperplasia is found in two other conditions besides chronic toxæmias—namely, during the involution of either the acute or chronic toxæmias. They are not generally found during the involution following a single acute toxæmia. They are typically found in the late stages of exophthalmic goitre, that is, following a combination of subacute toxæmias. Masses of colloid are formed from the hypertrophied tissue, which become encapsuled to form adenomata. Adenomata after the involution of the chronic toxæmias is typically seen in the late stages of endemic goitre.

Prevention.

It is proposed to separate the diseases of the thyroid into two groups: (*a*) Those in which the most prominent feature is hyperthyroidism (exophthalmic goitre type); (*b*) those in which the most prominent feature is thyroid enlargement (endemic goitre type). The methods adopted in preventing these will be considered separately.

(*a*) The prevention of exophthalmic goitre depends entirely on the recognition of the first stage—the early condition of hyperthyroidism. The presence of this is usually marked by the occurrence of nervousness, followed by falling out of the hair, sweating, and slight loss of weight: examination reveals all the signs of exophthalmic goitre in a minor degree; its detection necessitates examination of the skin, hair, and sweat glands, of the muscular tone, the sympathetic nervous, and the cardio-vascular system. The cases are to be found amongst those diagnosed as pyorrhœa, dyspepsia, early osteo-arthritis, chronic rhinitis, tuberculosis, cirrhosis of the liver, and chronic interstitial nephritis, the last two being of interest rather than of importance. In these cases the infection and its results are more prominent than the signs of thyroid excess. The cases are also to be found amongst the following, in which one symptom of thyroid excess is more prominent than the other: Hyperidrosis, alopecia, urticaria scripta, tachycardia, myocarditis, hysteria, and exophthalmia. These cases come under notice, not only in general practice, but also in the special departments. When a diagnosis is made, the case becomes a bacteriological study; both the nature and the focus of the infecting micro-organisms are to be found. A methodical examination should be undertaken, the history of any past illnesses elicited, and the date of onset of each noted.

The date of the onset of the symptom of thyroid excess should be compared with the date of the occurrence of the toxæmias. In this way a connection between the causatory toxæmia and the hyperthyroidism can often be elicited. An examination of the mouth, nose, lungs, &c., must be carried out for the site of the infection, and swabs and cultures to

find the causatory micro-organisms. In those cases in which the micro-oganisms have been constantly swallowed a bacteriological examination of the fæces should be made to find if the organisms have become indigenous in the intestine. When the causatory micro-organism and its site has been determined, means should be undertaken for its removal. Some minor surgical operation, such as teeth extraction, submucous resection of the nasal septum, removal of the nasal polypi, suffice to cure the condition, accompanied in appropriate cases with intestinal antiseptics such as thymol. In the cases that have been so treated the symptoms entirely disappeared in about six months; no intestinal antiseptics were used, as it was necessary to determine the exact connection between the toxæmia and the hyperthyroidism without the intervention of drugs. It may be as well to state that because carious teeth or a deviated septum happen to be present it is not sufficient to at once ascribe the cause to them. Only about 7 per cent. of cases of dental caries exhibit such symptoms. With a deflected septum there must be a very definite history of constantly recurring infection. It is also as well to remember that owing to the general vaso-dilatation all the mucous surfaces are flushed. Enlarged tonsils are but an effect, a part of the disease.

The following example shows the benefit of prevention.

Case 15.—N. B., female, aged 33, was seen with signs of early exophthalmic goitre, including double exophthalmos in association with pyorrhœa and carious teeth and frequent nasal infection. Six months after the removal of her teeth no signs of hyperthyroidism were present. Her sister, aged 38, gave a history of an exactly similar condition, but after an acute attack of influenza she developed exophthalmic goitre which after eight years terminated in myxœdema. When seen, her primary infecting foci were still present.

(*b*) Prevention of endemic goitre consists in adopting the precautions for preventing typhoid fever and other water-borne diseases.

Cure.

When a comparison is made between the microscopical appearances of a normal gland and those of exophthalmic goitre one is struck by the enormous cell increase that has taken place. In the solidification of the vesicles there are nearly ten times as many cells per vesicle; the vesicles themselves are also increased in number, so that when the gland is doubled in size the secreting area is increased some forty times. Involution to normal thus necessitates a reduction in the secreting cells to $\frac{1}{40}$. It may be deduced from the length of time taken for the symptoms of thyroid excess to disappear in the cases of simple hyperthyroidism that complete involution of the gland and the disappearance of the symptoms in exophthalmic goitre would take over six months. Any incidental toxæmia acting as a fresh stimulus would lead to a recurrence, the extent and duration of which would depend on the intensity and duration of the toxæmia. Observations have been made on cases following the removal of the infecting agent.

As far as possible, the patients while in hospital did not rest in bed—they got up early in the morning and did ward work, no medicinal or other treatment was given, so that any improvement could only be accounted for by the removal of the toxæmia.

The treatment adopted and the results obtained necessarily varied with the nature and the situation of the infecting micro-organisms. The most striking results were obtained in the very acute cases in which the infecting process could be completely removed. The following examples demonstrate the results obtained from removal of the infection in the four common situations.

Teeth.

The toxæmia derived from this source has but a preliminary action. It serves as a basis for the action of another to cause exophthalmic goitre. Only one example will be given, as it was discussed under Prevention.

Case 4 (p. 239).—A. L., male, aged 30. Hyperthyroidism was present for three years, associated with pyorrhœa. Following an acute infection in his nose, to which he was rendered liable by a badly deviated septum, exophthalmic goitre developed, accompanied with acute mania; pulse 130, respirations 36, and extreme myasthenia. He was treated with all the usual medicinal remedies without avail, and given up as moriturus. His mouth was put in order, and twenty-one teeth removed under gas and oxygen. Five days later he became quiet, and slept, and his three attendants were no longer needed. After fourteen days he had put on 23 lb. in weight, and at the end of three months he had put on 34½ lb.; pulse 108; exophthalmos had disappeared and the thyroid had diminished 1½ in. It was realized that the onset of any fresh toxæmia before involution was completed would cause a recurrence and probable death; but owing to myocardial degeneration it was thought inadvisable to attempt to prevent such by an operation on his nose or to diminish the effect that such could have by removal of a portion of his thyroid. It was hoped that complete involution would take place before the onset of a toxæmia. Four months later he developed another acute nasal infection, his symptoms rapidly recurred, and he died in another hospital despite all medicinal measures.

Nasal Cases.

Cauterization of the nose became the standard treatment for exophthalmic goitre after Hack, Frankel, Semon, and Spicer recorded cases cured by the removal of nasal polypi and other nasal affections. This soon dropped into disrepute, as the majority of cases are not nasal in origin.

Case 16.—E. L., female, aged 27. Gave a history of the symptoms of hyperthroidism for some years associated with carious teeth, and constantly recurring colds. Three months ago she had developed a very bad cold which lasted for a month, when

exophthalmic goitre occurred. Examination showed a soft enlargement of thyroid, an adenoma in the left lobe, with an average degree of symptoms; pulse 120. The teeth were carious, and right nasal septum and inferior turbinals were adherent. The adhesions were divided and the teeth removed; the symptoms cleared up with the exception of the adenoma in the left lobe, which was subsequently removed by operation. It had undergone cystic degeneration.

Case 17.—L. C., female, aged 26. Gave a four years' history of exophthalmic goitre. She had drunk water from a goitrous well, and had carious teeth and a chronic cold. The thyroid was but little enlarged, pulse (?) 160, marked exophthalmos, weight 86 lb. She was kept in bed until her condition had subsided from the last nasal infection, her teeth were then removed and a submucous resection performed. In nine weeks she weighed 105 lb.; the tachycardia and exophthalmos were only present during excitement.

Case 6. — M. J., female, aged 36. Three years' history of hyperthyroidism in association with carious teeth. Her thyroid had enlarged six months previously. Examination: A firm, hard enlargement of the thyroid with well-marked exophthalmic goitre, pulse 150, double exophthalmos, weight 87 lb. Her nose presented a black slough surrounding a perforation of the septal cartilage and chronic rhinitis. Her teeth were removed and the nose treated with nasal antiseptics. In four weeks her neck had diminished 1¼ in. At the end of fourteen weeks she weighed 124 lb., and the exophthalmos was not noticeable. During the involution an adenoma developed in the left lobe of her thyroid. Her heart was left in a condition of some myocardial degeneration with dilatation, and a pulse of 110.

In the nasal cases for the most part the toxæmia is not always present, but constantly recurs. Removal of the basal toxæmia causes the symptoms of exophthalmic goitre to subside. After-operations can with safety be performed on the nose to prevent the recurrence of the nasal infection and consequent exophthalmic goitre.

Lung.

From the microscopic appearances of the thyroids obtained from cases dead of tuberculosis it is concluded that only for a period of a few years is the gland in a hyperactive condition. It is only during this time that exophthalmic goitre is liable to develop.

In the early cases hyperthyroidism may be a transient phase which disappears perhaps to return after an exacerbation of the tuberculosis or the onset of another toxæmia. Observations have been made on five cases of typical exophthalmic goitre associated with chronic tuberculosis of the lungs. They were of a mild type with the exception of one case, which is quoted below. The basal toxæmia in four was pyorrhœa. The cases were observed for over a year, during which time the symptoms partially subsided, and the gland underwent degeneration with the formation of adenomata.

Case 18—M. R. F., female, aged 22. Gave a history of constant colds and hæmoptysis at 17, followed by exophthalmic goitre. Examination showed a pulsating thyroid, pulse 156, double exophthalmos, weight 115 lb., steadily decreasing. The nasal septum was deviated, and the mucous membrane in a condition of chronic rhinitis. Tuberculosis was present in the right apex. Partial thyroidectomy was performed under Crile's anoci-association. At the end of a month there was a great reduction in symptoms, but she had lost a further 9 lb. in weight. She was sent to the seaside, and her symptoms cleared up *pari passu* with the tuberculosis.

The indications for treatment of exophthalmic goitre associated with phthisis appear to depend on the extent of the infection, the degree of hyperthyroidism, and the condition of the gland. In the first stage, when the condition is transient, the treatment should be directed to the tuberculous focus. The same line also may be adopted in chronic phthisis; the symptoms subside with the cure of the infection or upon fibrosis of the gland. In the more acute variety the treatment will depend on the coexisting toxæmia. In all cases this should be removed or prevented. Sometimes it is not feasible, as in the above case, when prevention involves a serious operation on the nose. Here it seemed preferable to remove half the thyroid first, and then to complete the cure by sanatorium treatment.

Intestinal.

Hyperthyroidism and exophthalmic goitre, caused by the association of a toxæmia with that derived from the presence of coliform organisms in the intestine, are cured by removal of the source of the toxæmias.

The simplest of these is when endemic goitre is associated with carious teeth. Removal of the teeth and the administration of an intestinal antiseptic cause a rapid disappearance of the thyroid enlargement and the symptom of hyperthyroidism.

Case 19.—Female, aged 24. Drank well water from a goitre-producing well until two and a half years ago. She had had carious teeth for some years. Examination showed a soft even enlargement of the thyroid, medium type of exophthalmic goitre. Double exophthalmos, pulse 92. A mutant of *B. coli* was isolated from the fæces which decolorized litmus, sucrose, and produced no indol. Many carious teeth were present. After teeth extraction and the administration of thymol the neck diminished 1 in., the pulse became 78, and exophthalmos was not noticeable, and she increased 8 lb. in weight in a fortnight. The mutant of *B. coli* was not found after seventeen days' treatment, three days from the last dose of thymol.

Case 20.—A. F., female, aged 25, was in a condition of hyperthyroidism from endemic goitre and carious teeth; exophthalmic goitre developed after an attack of influenza and pleurisy. She was treated for two years with drugs and X-rays without effect. Examination showed a soft even enlargement of the thyroid, pulse 120, and marked unilateral exoph-

thalmos. The carious teeth and inferior turbinals were removed and thymol administered. In six months she increased 25 lb. in weight; the exophthalmos was only present on excitement and her pulse-rate was 84. An adenoma developed in the right lobe during involution.

Enlargement of the Thyroid without Signs of Excessive Secretion.

This group may be subdivided into three. (*a*) Those caused from the ingestion of the atypical forms of *B. coli* (endemic goitre). (*b*) Those caused by the combined effect of two toxæmias other than atypical *B. coli* that are capable of inducing a colloid hyperplasia. (*c*) During the involution following either the acute or chronic toxæmias.

(*a*) *Endemic Goitre.*—The history of the case is of great help in making a diagnosis. Every toxæmia from birth upwards and their date of onset should be noted. The character of the water supply should be ascertained both in the district in which the patient was born and in the districts where they have afterwards resided, with the dates and the time of onset of the thyroid enlargement. In this way the cases may be placed into groups according to their cause. A routine examination should then be made. A sample of the water should, if possible, be subjected to a bacteriological examination and the different members of the *B. coli* group isolated. The fæces are similarly examined and the causatory organism determined. Before treatment is commenced a careful examination of the gland should be made for the presence of adenomata and cysts. A preliminary purge is given (castor oil should not be used), thymol gr. x in cachets is administered two to three times a day for fourteen days; after a three days' interval it is repeated for another fourteen days. A week later the fæces are again examined. If the organism is still present another course of thymol is necessary. (Fats and oils must not be given within two to three hours of taking thymol.) Under this treatment the organisms are killed and the gland rapidly diminishes in size. The following may be taken as an example of the sixteen cases treated:—

Case 21.— G. F., female. The paracolon and the *B. lactis aërogenes* were isolated from the fæces. Twelve days after treatment with thymol her neck had diminished 1 in.; at the end of eight weeks it was of normal size, having diminished 2 in. She had previously been treated for six months with syr. ferri iodidi with only ¼ in. diminution.

Group (*b*).—After the nature of the toxæmias has been determined they should be removed, though for the most part they have ceased to act before the cases are seen.

Group (*c*) consists of adenomata and cysts that have developed in the course of involution. If the cause be still present it should be removed; often it has ceased to act long before the cases are seen, though from the history the causatory agent may be determined even twenty or thirty years after its onset.

The question arises—Up to what point can thyroid affections be cured by removal of the cause?

Enlargements of the thyroid, whether of the exophthalmic or endemic type, entirely subside after removal of the cause, providing this is done before the development of adenomata or cysts. Glands containing these will subside as a whole, but the adenomata or cysts are left. The administration of iodine may cause a slight diminution in their size, but they have not disappeared even after eighteen months' treatment. Cysts and adenomata should be treated along the usual surgical lines.

The symptoms of excessive secretion at first rapidly diminish after removal of the cause, and then more slowly *pari passu* with the diminution in the size of the gland. Any excitement will for the moment bring these symptoms again into evidence. If the disease has progressed so far that the various organs have become degenerated only partial recovery can be made. The patient may be left with a dilated heart, permanent albuminuria or glycosuria, or with some weakness of the nervous system, either central, peripheral, or sympathetic, leading to feeble mentality, paralysis of a nerve, or some vasomotor disturbance. These require appropriate treatment.

Acute Exophthalmic Goitre.

These cases arise from the effect of a toxæmia acting on a gland that is already hypertrophied and has led to hyperthyroidism or typical exophthalmic goitre. The added stimulus gives rise to an acute exacerbation which may rapidly lead to death. Treatment is a matter of difficulty, as the five cases quoted show. Medicinal measures may prove unavailing, removal of the toxæmia may be impracticable, and any attempt to remove a portion of the gland may prove fatal.

Case 4.—A. L., male, aged 30, developed an acute catarrhalis infection before involution was complete from exophthalmic goitre, and died in a few weeks despite all medical remedies.

Case 5.—F. H., male, aged 30. An extension of a catarrhalis infection on exophthalmic goitre caused death in five days despite medical remedies.

Case 22.—S. L., female, aged 28. Developed an acute catarrhalis infection on medium type of exophthalmic goitre and went rapidly downhill. An attempt to remove half the thyroid under Crile's anæsthesia proved fatal.

Case 23.—V. D., female, aged 25. Developed acute exophthalmic goitre on endemic goitre and teeth infection. She lost 26 lb. in weight, but recovered under medicinal treatment after appearing moriturus for some weeks. She now exhibits the combination of myxœdema and degeneration of various organs from exophthalmic goitre.

Case 24.—M. R., female, aged 51. An acute exophthalmic goitre developed from the effect of acute catarrhalis on exophthalmic goitre from chronic catarrhalis and teeth infection. Recovery after partial thyroidectomy under Crile's anæsthesia.

Conclusions and Summary.

Endemic goitre is caused by the toxins from the atypical forms of *B. coli*. The mutants are usually

conveyed by water. They become indigenous in the intestine, and different mutants of *B. coli* are to be found in the fæces of cases of endemic goitre. The mutants are but rarely present in the fæces of normal individuals, or in the fæces of individuals goitrous from other causes. It is possible to conceive circumstances which place the *B. coli* under abnormal conditions in the intestine itself, and lead to mutation and the temporary appearance of mutants in the fæces of normal individuals.

The mutants set up an apyrexial toxæmia, which stimulates the thyroid, so leading to a colloid hyperplasia and eventually to enlargement of the gland.

The whole process can be imitated in the laboratory, and endemic goitre induced in guinea-pigs by feeding with small doses of the mutants.

The supervention of a fresh toxæmia whilst the gland is in a hyperactive state causes a complete hyperplasia, with absorption of colloid and signs of hyperthyroidism up to a condition of exophthalmic goitre. This is dependent on the intensity and duration of the fresh toxæmia.

Endemic goitre is preventible by the avoidance of water contamination and by the sterilization of contaminated water.

It can be cured by the administration of intestinal antiseptics, the gland returns to normal, providing no degeneration has taken place. The gland as a whole involutes to normal, but the adenomata or cysts are left.

A condition similar to endemic goitre can be caused by other toxæmias capable of inducing a colloid hyperplasia.

Exophthalmic Goitre.

Exophthalmic goitre is due to a combination of toxæmias of an intensity sufficient to cause a hyperplasia with absorption of the colloid material. One acts during a period sufficient to give rise to a complete hyperplasia associated perhaps with slightly marked signs of hyperthyroidism without necessarily any glandular enlargement. The supervention of another infection stimulates the gland, which usually enlarges, and the signs of hyperthyroidism become very evident; the case develops into one of typical exophthalmic goitre. A nervous shock may lead to the diagnosis by suddenly bringing into evidence the symptoms of hyperthyroidism, especially those connected with the nervous system.

The severity and duration of exophthalmic goitre is dependent on the intensity and duration of the toxæmias. If they be of short duration the disease will disappear in a few months.

Exophthalmic goitre can be prevented by the detection of the early cases of hyperthyroidism and the consequent removal of the basal toxæmia.

Exophthalmic goitre can be cured if the causatory agents be removed before degeneration has occurred either in the gland or in those organs that are affected by the hypersecretion.

When degeneration has taken place in the thyroid, removal of the toxæmias causes involution to take place only in the hypertrophied portion; the adenomata and cysts are left. These require appropriate surgical treatment, as they to a certain extent keep up the symptoms of thyroid excess. Surgical treatment without removal of the cause is followed by recurrence unless so much of the gland substance has been removed that hypersecretion is impossible. Degeneration in the other organs partially recovers after involution of the thyroid; appropriate treatment is necessary for those that remain. Acute cases of exophthalmic goitre may present themselves in which surgical treatment is the only means of saving them, though the risk of death under the anæsthetic perhaps precludes operation.

Notes and News.

LIVERPOOL SCHOOL OF TROPICAL MEDICINE.

ON Thursday, July 23, 1914, the Countess of Derby opened a new ward at the Royal Infirmary, Liverpool, to be known in future as the "Sir Alfred Jones" Tropical Ward. Heretofore the Southern Hospital in Liverpool had given accommodation to the cases of tropical diseases, and placed the beds at the disposal of the Tropical School authorities; but as the chairman, Mr. F. C. Danson, remarked, "They had, however, grown out of the accommodation generously provided at the Southern Hospital in Liverpool, and, having regard to the necessity of having a thoroughly well equipped laboratory on the spot so as to enable the students to do their work close to where the patients were lying, it was apparent that the Royal Infirmary was the best site for such a ward, because of its proximity to the School."

The Earl of Derby said that Liverpool and its Tropical School had set an example to the world, and he was glad they were not now going to lag behind. He had no doubt that science would be much advanced by that new ward.

TRIBUTE TO THE LATE SIR A. L. JONES.

Sir Thomas Barlow, at a luncheon given subsequently in his honour by Mr. Danson, described the late Sir A. L. Jones as like a comet, having regard to the vast amount of valuable work he accomplished in a comparatively short life. In commending the work of the Liverpool School of Tropical Medicine, he referred to the fact that they were about to embark on a third step in bringing the study of tropical diseases within the curriculum of the medical undergraduate. "So long as they maintained the Colonies and the Colonial Medical Service, and their kith and kin went out there to work, so long surely it was right to arouse the interest of their medical students in the fascinating problems which were crying for solution, and which, when they were solved, would bring untold benefit to mankind."

Original Communications.

A STUDY OF THE NITROGENOUS METABOLISM IN CHYLURIA.

By W. J. Young.

From the Australian Institute of Tropical Medicine, Townsville, Queensland.

The condition of the urine in chyluria has hitherto been studied from the point of view of the fatty material which it contains, and very little work has been done on the albuminous matter and other nitrogenous constituents. In 1913 and 1914 two cases of chyluria were admitted to the tropical ward of the Townsville General Hospital, and the opportunity was taken to examine the urines with regard to the distribution of nitrogen in them. The cases were in the charge of Dr. Breinl, who has contributed the clinical notes.

Case 1.—Mrs. D., aged 42, was admitted to the hospital on March 12, 1913. She had lived all her life in North Queensland, mostly in the north-western portion. According to her own statement she noticed about twenty years ago that her urine suddenly became milky in appearance, and clotted into jelly-like masses if left standing for any length of time. She did not notice any blood in the urine at the time. This condition was not accompanied by any discomfort and she suffered no pains whatsoever. Within the last ten years, however, she had experienced dull aching pains in the small of the back and had observed at times that the urine was stained with blood. At no time was any difficulty experienced in passing the urine.

On examination no physical signs could be detected. The patient was a tall well-nourished woman and seemed hardly affected in her well-being by her condition. The urine had a milky appearance and when allowed to stand for some time gelatinous clots formed. The blood of the patient had never been previously examined for filaria. Samples of the blood were taken on admission and at varying intervals both in the day and night time, but it was never found to contain any filaria larvæ.

The patient remained in the hospital for nearly seven weeks, being treated at first with increasing doses of oleum terebinthini. As this treatment did not seem to give any relief it was changed to ichthyol in capsules.

The bladder was washed out with a solution of silver nitrate, which was increased from 4 to 8 gr. per 16 oz. Her diet was carefully regulated and all fats in the shape of milk, butter, &c., were banished from it.

During the whole time in the hospital her temperature only rose on two days to 99° F. with a corresponding rise in the pulse-rate, but was always normal otherwise.

On the whole neither the turpentine nor the ichthyol affected the condition. The urine was always milky. The washing out of the bladder with silver nitrate, however, seemed to give the patient some relief.

The patient left the hospital on April 28, without showing any improvement as regards the condition of her urine.

Case 2.—Matthew F., aged 23, a miner, was admitted to the hospital on December 13. This patient had spent all his life in North Queensland, north of Cairns. He noticed first about eight years ago that he had difficulty in passing his urine as it contained small jelly-like, blood-stained clots. He noticed further that his urine became milky and clotted when left standing for some time. At the same time he had dull aching pains in his back. His urine then remained milky for about two weeks. Ever since he had the same kind of attacks periodically, which lasted only for a short time, the urine being quite normal in the interval.

Within the last three months, however, his urine had remained milky continuously, being often very much blood-stained, and was always more cloudy in the morning than during the rest of the day. With the exception of his trouble in passing the urine, and slight pains in the back, the patient felt quite well.

On admission, no physical signs could be detected; there was no swelling in the groin, nor any other sign of filariasis. His blood was examined repeatedly at different hours of the day and night, but filaria larvæ could never be found. His urine was slightly increased in amount, varying between 48 and 104 oz., the increased quantity being due to the administration of diuretics. The urine was milky and generally of a pinkish colour.

The treatment consisted first in the administration of oleum terebinthini in increasing doses, starting with 21 minims daily and increasing to 84 minims. This medication was kept up for nearly three weeks, but did not seem to effect any improvement. Ichthyol in pill form was substituted later, beginning with 7·5 gr. daily and increasing to 30 gr. As this did not affect the condition to any appreciable extent, methylene blue was administered in gelatine capsules up to 20 gr. daily.

The urine improved slightly, the morning urine became quite clear for a time, but the daily urine was still of the same condition as before. The improvement, however, only lasted for a few days.

Diuretics seemed to be the only effective remedy, as during the time of their administration no retention took place. The patient was kept in bed on a fat-free diet.

The temperature remained normal all the time he was in the hospital.

He was discharged on March 16, 1914, without showing any improvement in the condition of his urine.

Both these cases were true chyluria. The urines always contained fat, which could be extracted with ether, but the milky appearance could not be entirely removed in this way.

An estimation of the quantity of fat in the urine was only made on one twenty-four-hour sample in each case. This was done by a modification of Meig's method for determining the fat in milk. 100 c.c. of urine were shaken in a stoppered cylinder with a mixture

of ether (20 c.c.) and alcohol (20 c.c.). The fluid was allowed to stand for a few minutes and the ethereal layer removed into a tarred flask, by replacing the cylinder by a rubber stopper containing the well-known wash-bottle arrangement of tubes, dipping down just above the junction of the two layers. This extraction process was repeated three or four times, the ether was then evaporated off, and the flask and contents dried at 100° and weighed. The twenty-four-hour sample in Case 1 contained 1·8 per cent. and that in Case 2, 2·6 per cent. of fat.

A quantity of protein was present which showed the properties of the proteins of the lymph. It coagulated when the urines were heated to 70 to 75° C. and contained a globulin precipitated by half saturation with ammonium sulphate, and an albumin precipitated when the liquid was completely saturated with this salt.

On standing, large jelly-like masses formed in the urines, due to the action of the clotting enzymes of the lymph on the proteins. This could be prevented by collecting the urines in a vessel containing potassium oxalate, when the urines remained quite liquid and free from all clots, and in the analyses tabulated later this procedure was always followed.

In Case 1 the sediment on centrifugalization contained some leucocytes, a varying but always small number of red blood corpuscles, epithelial cells and crystals. After prolonged centrifugalization, or after standing in the presence of antiseptics for some days, the fluid became somewhat clearer, but no distinct separation into two layers could be observed

In Case 2, a separation into two layers was often observed, a pinkish blood-stained, slimy bottom layer, containing the sediment, and a second milky layer. The sediment when examined microscopically consisted of red and white corpuscles and granules.

In neither case was any sugar found in the urine.

In Case 1, a fairly complete analysis of the nitrogenous constituents of the urine was made daily for a period of fourteen days. The results are given in Table I, all the constituents being expressed in terms of the nitrogen they contain.

The protein nitrogen was determined by adding 20 c.c. of a saturated solution of sodium chloride to 100 c.c. of the urine contained in a 200 c.c. measuring flask, making faintly acid with acetic acid, and coagulating the protein by immersing the flask in a bath of boiling water for thirty minutes. The mixture was then cooled, made up to the mark with distilled water, filtered, and the unpreciptated nitrogen determined in an aliquot part of the clear filtrate by Kjeldahl. The difference between this non-protein nitrogen, calculated up to the original volume of the twenty-four-hour urine, and the total nitrogen of the urine determined by Kjeldahl, corresponded to the nitrogen present as protein. The absolute quantity of protein may be obtained by multiplying this figure by the usual protein-nitrogen factor 6·25. This method is much simpler than the usual one of weighing the coagulate, since it avoids the laborious process of washing and drying to a constant weight. Moreover, in these urines, fat is carried down with the coagulate, and this would have to be removed before the protein could be weighed.

The result by this shorter method is substantially the same as is seen in the following experiment in which the protein was determined by both methods in samples of the same urine. The figures are calculated for the total volume of urine for twenty-four hours.

Total nitrogen of urine	.. 7·310 grm.	
Uncoagulated nitrogen	.. 6·350 ,,	
Protein nitrogen	.. 0 960	.. 6·00 grm. protein.

By weighing the coagulate after washing, drying, extracting the fat with ether and drying to constancy, 6·06 grm. were obtained. In every case the clear filtrate from the protein precipitation was tested to see that it was quite free from protein, and if any was found a fresh determination was made.

The other nitrogenous constituents were determined in the urine after removal of the protein, urea by Folin's potassium acetate method, ammonia (Folin), uric acid (Folin-Schäfer), creatinine and creatine (Folin).

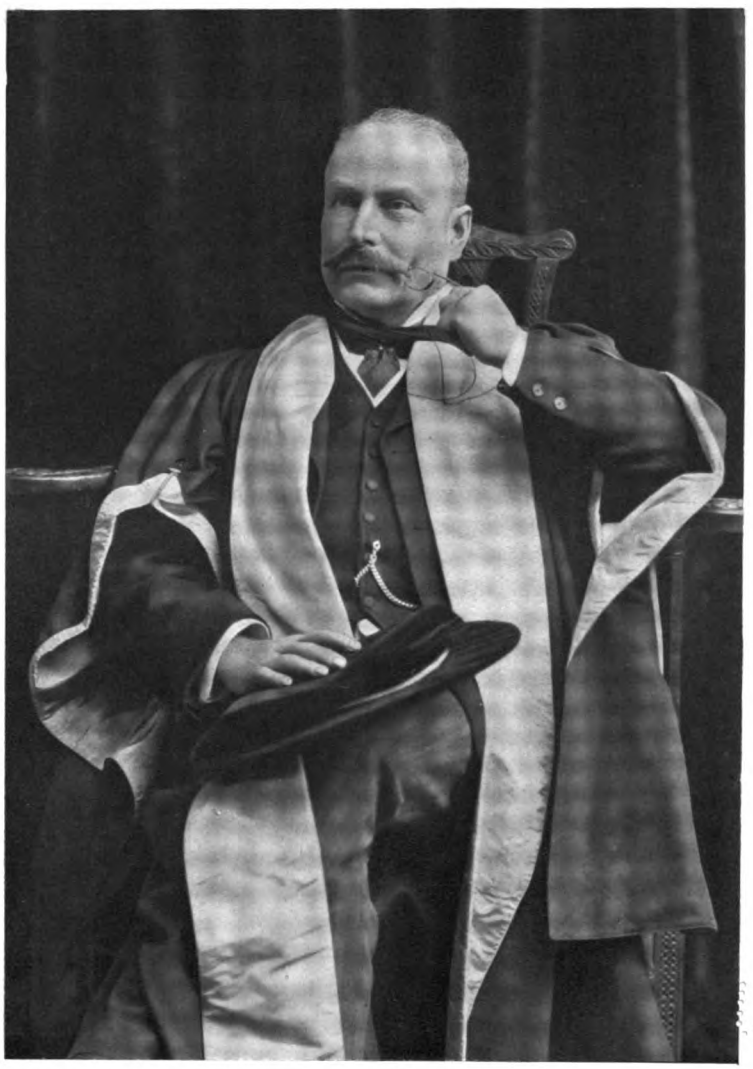
The patient was maintained on a diet consisting of lean meat, bread and potatoes, the nitrogen content of which was approximately 15 grm. However, the quantity of food represented by the amount of nitrogen invariably proved more than that dictated by the patient's appetite, and some food was always left untouched.

The weight of the patient was unfortunately not taken, but she was above medium height and showed no signs of wasting.

The quantity of protein-nitrogen excreted per day varied considerably, from 0·49 grm. to as much as 1·94 grm., the average for the fourteen days being 0·95 grm. per diem, corresponding approximately to 6 grm. of protein.

Table I shows a low grade of nitrogenous metabolism. The non-protein nitrogen representing protein actually utilized in metabolism was very small in quantity, the average twenty-four hourly excretion being 6·39 grm. This represents approximately only 40 grm. of protein catabolized.

If the protein nitrogen be left out of account the other constituents of the urine show a normally balanced nitrogenous metabolism. When considered in percentages of the total non-protein nitrogen they are of the same order as those given by Folin (*American of Journal Physiology*, xiii, p. 70) for similar levels of catabolized protein. Thus the urea rises and falls with the total non-protein nitrogen representing on the average 69·4 per cent. of this nitrogen, whilst the ammonia corresponded to 6·6 per cent. and the uric acid to 2·2 per cent. The quantity of creatinine nitrogen excreted is rather low, the average being only 0·34 grm. per diem, or 5·5 per cent. of the non-protein nitrogen. The creatinine in the urine of normal individuals represents the tissue or endogenous metabolism, and is independent of the quantity of nitrogen in the diet. The percentage of the total nitrogen which is excreted as creatinine or $\frac{\text{Creatinine} \times 100}{\text{Total nitrogen}}$ therefore increases as the total



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TABLE I.

Date	Volume in cubic centimetres	Gravity	Total nitrogen	Protein as nitrogen	Non-protein nitrogen	Nitrogen as				Per cent. of non-protein nitrogen				
						Urea	Ammonia	Creatinine	Uric acid	Urea	Ammonia	Creatinine	Uric acid	Undetermined
1913														
April 8 ..	975	1014	7·31	0·96	6·35	4·70	0·45	0·34	0·13	74·0	7·1	5·4	2·0	11·4
,, 9 ..	1,112	1012	7·21	0·94	6·27	4·75	0·51	0·40	0·17	75·7	8·1	6·4	2·7	5·4
,, 10 ..	1,113	1014	6·98	1·00	5·98	4·34	0·38	0·34	0·12	72·7	6·3	5·7	2·0	13·2
,, 11 ..	1,220	1013	8·25	1·13	7·12	4·98	0·60	0·39	0·16	69·9	8·4	5·5	2·2	13·9
,, 12 ..	1,070	1016	7·52	0·60	6·92	4·87	0·44	0·34	0·15	70·4	6·3	4·9	2·2	16·2
,, 13 ..	990	1016	7·12	1·44	5·68	3·97	0·36	0·38	0·08	69·9	6·3	6·7	1·4	14·2
,, 14 ..	760	1017	6·79	0·83	5·96	3·87	0·32	0·34	0·16	64·9	5·4	5·7	2·7	21·3
,, 15 ..	730	1017	6·01	0·82	5·19	3·42	0·25	0·34	0·13	66·0	4·8	6·5	2·5	20·2
,, 16 ..	666	1016	6·68	1·94	4·74	3·00	0·35	0·33	0·14	63·3	7·4	7·0	2·9	19·4
,, 17 ..	890	1018	8·16	0·49	7·67	5·13	0·46	0·34	0·18	66·8	6·0	4·4	2·3	20·8
,, 18 ..	785	1018	8·68	0·62	8·06	6·01	0·50	0·38	0·19	74·4	6·2	4·7	2·4	12·3
,, 19 ..	935	1012	7·22	1·27	5·95	3·71	0·36	0·27	0·13	62·4	6·0	4·5	2·2	24·9
,, 20 ..	640	1018	6·08	0·82	5·26	3·10	0·40	0·28	0·11	58·9	7·6	5·3	2·1	26·1
,, 21 ..	930	1020	8·79	0·53	8·26	6·11	0·56	0·27	0·15	74·0	6·8	3·3	1·8	14·2
Average			7·34	0·95	6·39	4·42	0·42	0·34	0·14	69·4	6·6	5·4	2·2	16·9

protein catabolized decreases, and at a protein level corresponding to that of the patient this ratio is normally somewhat higher than was observed in this case.

Case 2.—In this experiment the patient was kept on two different diets. During the first eight days the diet consisted of lean meat, eggs, and bread carefully weighed out and equal in quantity to 15·4 grm. of nitrogen per diem, whilst in the succeeding six days a diet of eggs, milk, bread and butter was partaken of which was uncontrolled as regards quantity.

TABLE II.

Date	Volume in cubic centimetres	Total nitrogen	Protein nitrogen	Non-protein nitrogen	Creatinine nitrogen	Creatine nitrogen	Creatinine and creatine per cent. of non-protein nitrogen
1914							
Dec. 20 ..	1,865	14·56	1·90	12·66	0·48	0·21	5·4
,, 21 ..	1,120	15·25	1·81	13·44	0·47	0·20	5·0
,, 22 ..	1,765	13·72	2·18	11·54	0·46	0·0	4·0
,, 23 ..	1,984	15·29	3·00	12·29	0·54	0·11	5·3
,, 24 ..	2,195	14·18	2·96	11·22	0·42	..	3·8
,, 25 ..	1,525	14·21	3·12	11·09	0·43	..	3·9
,, 26 ..	1,880	16·18	3·39	12·79	0·52	..	4·1
,, 27 ..	2,110	11·68	1·57	10·08	0·37	0·20	5·6
Average ..	..	14·38	2·49	11·89	0·46	0·18	4·6
Dec. 28 ..	1,640	12·21	2·80	9·1	0·52	..	5·5
,, 29 ..	2,155	11·76	2·42	9·34	0·51	..	5·5
,, 30 ..	2,820	10·58	2·48	8·10	0·47	..	5·8
,, 31 ..	2,040	9·76	2·06	7·70	0·48	..	6·2
Jan. 1 ..	3,195	8·66	1·93	6·73	0·44	..	6·6
,, 2 ..	1,500	8·06	1·96	6·10	0·43	..	7·0
Average ..	..	10·17	2·27	7·90	0·47	..	6·1

The analyses of the urine are given in Table II. It will be noticed that the volume of urine passed varied very considerably, the two extremes being 1,120 c.c. and 3,195 c.c. in twenty-four hours.

The daily loss of lymph proteins as determined by the albumin passed in the urine was much greater than in the previous case, the daily average for the fourteen days being 2·40 grm. of nitrogen, equivalent to 15 grm. of protein. It varied from 10 grm. to as much as 21·5 grm. per diem.

TABLE III.

Nitrogen consumed in food, 15·4 grm.

Nitrogen excreted			Balance
Urine	Fæces	Total	
14·56 ..	0·95 ..	15·51 ..	− 0·1
15·25 ..	0·76 ..	16·01 ..	− 0·6
13·72 ..	1·20 ..	14·92 ..	+ 0·5
15·29 ..	.. ..	15·29 ..	+ 0·1
14·18 ..	1·11 ..	15·29 ..	+ 0·1
14·21 ..	0·99 ..	15·20 ..	+ 0·2
16·18 ..	.. ..	16·18 ..	− 1·8
11·65 ..	1·45 ..	13·10 ..	+ 2·3
			+ 0·7

During the first eight days the protein catabolized daily, as represented by the non-protein nitrogen, averaged 11·89 grm., approximately 74 grm. of protein, which is quite a normal figure. The patient consumed the whole of the food given, and did not find the amount excessive. In the second period, however, when the diet was controlled only by his appetite, the quantity of nitrogen excreted decreased gradually and steadily the non-protein nitrogen falling as low as 6·1 grm. per diem, corresponding to only 38 grm. of protein catabolized, a figure below normal. Moreover, it had not reached a minimum, but was still decreasing when the experiment ceased.

The only other constituents of the urine which were estimated were the creatinine and creatine, the former

being quite normal in amount, the percentage ratio to the total nitrogen normally increasing as the protein catabolized decreased. The second diet had the advantage of being practically free from creatinine and creatine, so that the creatinine present in the urine during this time should give a fair picture of the tissue metabolism. Creatine was occasionally present in the urine when the patient was on a meat diet, but was always absent when the food was creatine-free.

It seemed of interest to ascertain whether a patient losing so much protein was maintaining nitrogen equilibrium, and during the first period when a definite amount of protein was eaten a balance-sheet was made out between the nitrogen intake and that excreted. The total nitrogen in the urine and fæces was determined in the usual manner, and a sample of each food was analysed as regards its nitrogen content. During this experiment the food was carefully weighed and the whole quantity was eaten.

Table III embodies the results of this experiment and shows that the patient was practically in nitrogen equilibrium, the result of the whole eight days being a nitrogen retention of 0·7 grm. or about 5 grm. of protein.

An examination of the figures representing the quantity of protein passed in the urine in this case shows that it was not materially affected by the nature of the diet. In the first eight days the diet was chosen in accordance with the usual treatment and was almost free from fat, whereas in the second period the diet was rich in fat. The quantity of protein excreted remained on the average practically the same, and the urine was not altered in appearance by the change.

Both cases were true chyluria, the urines containing fat and lymph proteins. It has been pointed out that in both cases filaria larvæ could not be found in the peripheral blood, neither during the day nor during the night. This absence, however, does not prove that the chyluria was not of filaria origin as it is well known that definite symptoms of filariasis may be observed in patients, even when repeated and careful examination does not reveal the presence of the parasites. Moreover, filaria larvæ may have been previously present in the blood and may have since disappeared.

The general protein metabolism was not affected by the continued loss of lymph. In the first case the level of protein catabolized was very low, but the relative quantities of ammonia, uric acid and creatinine were of the same order as those in normal urines with similar protein levels of metabolism.

In the second case, when the diet was constant in amount and of normal protein content, nitrogenous equilibrium was more than maintained.

The quantity of chyle in the urine as measured by the proteins excreted was, on the average, the same whether the diet was free from fat or rich in fat. The usual practice of reducing the fats to a minimum does not appear to be justified by this experiment.

The quantity of proteins present in the urines is the best guide to the condition of the patient in chyluria, since these are the substances which clot to jelly-like masses, to which is due the difficulty of passing urine often experienced.

FURTHER NOTES ON ENTAMŒBIASIS.

By Dr. Lim Boon Keng.

Since writing my last paper I have had many opportunities of examining patients suffering from various diseases, which clinically we have been in the habit of associating with one another, such as rheumatism with sciatica, pleurisy, asthma and sundry skin affections of the urticarious and erythematous type. The relation of rheumatic pains, erythema and prurigo with dysentery and hepatic abscess, has been noted since the days of Graves and Murchison. The result of my observations is that all rheumatic inflammations and rheumatism as seen in Singapore, are associated with a protozoon organism, whose characteristics and life-cycles I propose to summarize briefly, leaving to a later occasion to bring forward clinical and other data to substantitate my conclusions.

The organism is found in the intestinal canal in many persons, but mainly in those suffering from lithæmia, rheumatism, bronchitis, asthma, an irregular remittent fever, various inflammations, sciatica, lumbago, urticaria, erythema marginatum, erythema nodosum, prurigo, impetigo herpetiformis, lichen rubra acuminata, and chronic gastrodynia. One patient had painful micturition as if passing gravel, the urine being red and having a brick-dust deposit. In many of these patients, the organism is also found in the sputum, the urine, in the blood and in the skin eruptions.

As the life-cycles are somewhat complicated, we may begin with the small free trophozoite amœba, which has small granules and moves by means of hyaline pseudopodia. Probably these are similar to the amœba described by Noc. They form a plasmodium, and are embedded in a large mass of mucin-like substance into which the cells discharge numerous rounded oval or spindle-shaped granules. This stage corresponds with the myxamœba state of the mycetozoa. From this plasmodium is developed a fungus-like thallus with cellulose walls with central venation, which sends off branches. The veins are filled with a mucin-like mass of fibrils, many of which are twisted round. The substance of the thallus is divided into many cylindrical cells. The walls are perforated so that the chambers communicate with one another. In the substance of the thallus in proximity to the vein, a crystalline core is developed, there being two kinds of crystalline bodies, colourless phosphatic and brownish-red urates. Around these the cells of the plasmodium grow and build up the crystals, and the bodies called sori, which develop in the chambers of the thallus, between the soral masses, which appear like pieces of indian corn thrown together in a systematic way. These are oval or round cysts. From these grow amœbulæ and flagellæ, which undergo

development as free amœbæ or agglomerate to form the plasmodium, after pairing and forming the zygote amœba. This is the propagative plasmodial stage, or the amœbæ may be seen undergoing fission giving rise to the active forms in which the amœba is phagocytic and histolitic. The parasite may then attack all tissues causing dysentery, broncho-pneumonia, endometritis, orchitis, boils and other serious troubles.

Under unfavourable conditions the amœbæ or amœbulæ become encysted, while some form into spores with the cyst walls, others evidently remain in the amœboid stage and creep out when the cyst ruptures.

It is my impression that we have to deal with more than one species. At least two distinct species (that producing dysentery, liver abscess and their inflammations; and that giving rise to rheumatism and its allies) may be clinically admitted although it is possible that in dysentery we have to deal only with a special phase of the multiplicative stage. This question of the relationship between dysentery and the rheumatic states cannot yet be settled. It is almost impossible at times to say from microscopic examinations that the amœboid bodies found in endometritis, broncho-pneumonia, and skin sinuses are not the entamœbæ histolitica. And the different diseases named are often found in persons who have had an attack of dysentery, although the greater number of those rheumatic and lithæmic patients have never had dysentery.

The association of the parasite with the different diseases is shown by the following table:—

Stage in life-cycle.	*Condition of host.*
(I) Fungus-like plasmodium.	Constipation.
(*a*) Few free amœbæ in the fæces.	Flatulence, biliousness, and hepatic congestion, headache, vertigo, dizziness, lithæmia, pyrosis, nervous symptoms, urticaria.
(*b*) Granular amœbæ also present in sputum.	Pharyngeal irritation, colds and bronchitis.
(*c*) Free amœbæ plentiful in fæces, sputum and blood.	Rheumatism, with arthritis and heart disease, toxæmia, typho-malarial type of fever, acute urticaria, prurigo, boils, &c., tonsillitis, sciatica and gravel.
(II) Multiplicative phase. Large granular amœbæ undergoing fission, schizogamy and budding by means of chromidia shedding.	Acute dysentery, acute gastritis and colitis, broncho-pneumonia, bronchiectasis and phthisis, adenitis metritis and pelvic abscess, peritonitis, nephritis, appendicitis, hepatic abscess, pyæmia.
(III) Encysted stage.	Recovery for the time being or improvement in the patient's condition. Relapse occurs when the cysts burst and the parasites resume the active *rôle*.
(IV) Parasites in all stages flourish in the blood in extensive areas and affecting the kidneys.	Cachexia, anasarca, anæmia, debility, sweats.

Thus we must note that the variations, relapses and sequelæ of dysentery and rheumatism are due to the combination of stages as well as to the resistant character of the cysts, spores and fungi-like state. The persistence of these diseases is thus explained by the organism causing them undergoing metamorphosis and remaining as a harmless saprophyte in the skin or alimentary canal. When the host suffers from the influence of cold, worry, or other depressing causes the trophozoite amœbæ assume the multiplicative form, and then invade the tissues by attacking red blood corpuscles or dissolve tissues by means of a liquid derived from special granules secreted by their protoplasm. Such liquid causes toxæmia, urticaria, and ephemeral eruptions.

In the thallus are found white crystals probably of a phosphatic nature, and around the central crystalline core are amorphous reddish mineral substances indistinguishable from amorphous urates. Coiled round the venation and making impressions on the mineral core, are spirals of cellulose or mucin. As the thallus has been seen by me in cases of chronic bronchitis, asthma, and bronchiectasis, I feel sure we have now in these the explanation of the origin and presence of Curschmann's spirals and of the Charcot-Leyden crystals and the so-called "exudation cells," the last being, no doubt, the amœbæ undergoing degeneration. In one patient such crystals, together with amœbæ and fragments of the thallus in the urine, give rise to symptoms such as are due to gravel. If the red amorphus mineral is proved to be really urates the difficulty of accounting for the uric acid in rheumatism and allied conditions is thus also explained. In any case, in all the patients examined, the presence of crystals, parts of the thallus and the amœbæ accounts for the irritative, painful and inflammatory conditions to which physicians have given different clinical topographical names. My observations show that these rheumatic conditions are all related. They differ only with regard to the stage of the parasite and the resistance of the patient. We are now able to understand why the benzoates, salicylates, and aromatic oils are useful in all these conditions. The value of potassium iodide in asthma, bronchitis, chronic rheumatism, and enlarged glands is also explained. The curative influence of arsenic is no longer a mystery.

Therapeutic Note.—The details of the life-cycles of the parasite have yet to be studied, but so far the

changes observed by me explain why our treatment has, so far, been so unsatisfactory. Emetine hydrochloride, the salicylates, and benzoates have no effect upon the cyst and upon the glutinous covering of the thallus. Consequently, treatment has to be continued till the flagellulæ and amœbulæ are formed. When the organism continues to exist in holophytic fusion by means of chromatophores and pyrenoid granules these drugs can no longer influence them.

The latest form of the entamœba is thus unaffected by the drugs which are rapidly fatal to the amœboid organism.

I have, therefore, devised a form of treatment calculated to deal with the parasite in any stage of its metamorphosis. In mercurial preparations, phenol, urotropine, and chlorine or other halogen gases, we have effective remedies which can destroy the vitality of the fungi-stage of the parasite. In the olden days mercury was the treatment for rheumatism and doubtless the evil effects were due to the salivation and mercurialism; thanks to this humoral pathology of the time.

But we should not administer mercury to the stage of salivation. For acute dysentery I prescribe grey powder and salol with pulv. cinnamom. co. and Dover's powder, followed or preceded by a dose of castor oil. In severe cases, at least 1 gr. of emetine chloride should be injected intramuscularly twice a day at first, and then once daily till no amœbæ are observable in the stools. This stage coincides with the appearance of formed stools. Then the cysts and the thallus begin to appear. The thallus stage is recognized by the presence of granules chromatophores, cellulose cell wall, opaque cysts, spirals, and crystals.

In this condition the antiseptics are required. I think grey powder with bismuth salicylate or salol and aromatic chalk the best preparation for this stage. The carminative waters are useful excipients or adjuvants even when cachets or powders are prescribed. In an obstinate case, Yeo's chlorine mixture for a week is an effective if unpleasant remedy. In chronic lithæmia and bronchial cases I have found Dr. Carle's method of administrating potassium iodide 30 gr. after breakfast and a tablespoonful of Yeo's mixture after lunch, the latter mixture being repeated two or three times in the afternoon at intervals of an hour—a good and certain way of acting on the parasite.

In nearly all the rheumatic conditions named, I have since my discovery of the mycetozoan parasite, treated with emetine, chlorine water or grey powder with almost better results than the salicylates, but it is best to combine these remedies according to the indications present.

The value of emetine in metrorrhagia, gastrodynia, hæmoptysis, melæna, sciatica, pleurisy, bronchitis, asthma, urticaria and prurigo is, in my practice, absolutely established. This fact alone goes far to prove that these diverse states are due to one cause. Syphilis affords us the best parallel of a pleomorphic disease and all forms of which are amenable to the same specific treatment.

Nature and Name of the Parasite.—As far as I can make out the parasite is a mycetozoon, and is a form of chlamydomysca. The fungus stage closely resembles a mycetozoa I have found in house drains and is almost indistinguishable from a parasite in the intestinal canal of fowls. I was led to examine the fæces of the latter by the fact that subcutaneous injection of a syringeful of mucus containing live amœbæ produced no effect beyond a transient pyrexia.

Provisionally, we may call it *Chlamydosporia toxifera* on account of its toxic effect upon man.

THE WAR AND DRUG SUPPLY.

AT present there is a SHORTAGE of the following drugs:—

Salicylate group: Salicylate of soda, salicylic acid, salicin, and aceto-salicylic acid; bromides (sodium, potassium, ammonium, &c.); potassium salts: bicarbonate, acetate, and citrate; acid tartrate of potash (cream of tartar), tartrate, and sulphate; chlorate of potash and permanganate of potash; glycerophosphates; liquid paraffin; synthetic benzoic acid and salts (the following preparations which contain benzoic acid should also be sparingly used: tr. camph. co., tr. opii ammoniata). N.B.—There is no reported shortage of benzoin itself and consequently none of tr. benzoin co. (Friar's Balsam).

Of the following drugs, the supply is NOT TOO ABUNDANT:—

Citric acid, tartaric acid; synthetic products: phenazone, acetanilid, phenacetin, &c.; ergot; formaldehyde and its derivatives; hexamethylenetetramine and allied compounds; and gentian root.

ELIMINATION OF THE NARCOTIC ACTION OF ALCOHOLS BY FATS.

The harmful narcotic action of alcohols of the fatty series may be eliminated or greatly modified by administering simultaneously fixed oils or fats. In the case of amylene hydrate or of paraldehyde, if fat be introduced into the stomach at the same time, the narcotic action of these hypnotics may be entirely eliminated so that doses which, by themselves, would be powerfully narcotic, are rendered quite inactive. With ethyl alcohol, the simultaneous administration of fat has also a very marked action in diminishing the narcotic effect. It is even possible to obtain a cessation of the effects of alcoholic intoxication in cats by administering cream to the animals, provided the dose of alcohol has not been too great. This action is remarkable and unexpected. It is not at present explicable.—M. Sulzmann (*Archiv. exper. Path.*).

Notices.

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1.—**The address of** THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE **is Messrs. Bale, Sons and Danielsson, Ltd., 83-91, Great Titchfield Street, London, W.**

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8.—The Journal will be issued about the first and fifteenth of every month.

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9.—**Manuscripts if not accepted will be returned.**

10.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 15, 1914.

BRITISH MEDICAL ASSOCIATION MEETING, ABERDEEN 1914.

President, Professor R. T. Simpson, C.M.G. (London).

Secretary, Dr. C. A. Williamson (Aberdeen).

First Day. Wednesday, July 29.

OPENING ADDRESS.

THE President, Professor R. T. SIMPSON, G.M.G. (London), made the opening address, in which he feelingly referred to the first meeting of this section held in Edinburgh only sixteen years ago under the presidency of Sir Patrick Manson, G.C.M.G., on which occasion he had unfolded his mosquito-malaria theory and the remarkable confirmatory discoveries of Sir Ronald Ross. The immediate effect of their work was that men's minds, which had been occupied since the discoveries of Pasteur, Koch and Lister with the all-absorbing study of bacteria as the causal agents of disease and of vehicles by which these bacteria were conveyed into the human body, were now diverted to the study of protozoal organisms and the rôle of insects in the dissemination of disease. This study had been exceptionally fruitful and all students are familiar with the great advances and additions to our knowledge that have followed, and which we owe to the labours of Leishman, Bruce, Low, Castellani, Dutton, Daniels, Rogers, and a host of other workers. Some of their advances were indicated by the new nomenclature of disease which was rendered necessary, such as leishmaniasis, trypanosomiasis, and phlebotomus fever. With the exception of Sir Alfred Jones and some of the Liverpool merchants, the wealthy men of Great Britain had so far not wakened to the fact that endowments for the prevention of disease are as important as contributions to the large hospitals. It was necessary that the profession should be alive to the great danger threatening laboratories by the swamping and research by ordinary routine work —while a more liberal encouragement of scientific research should be advocated, it was necessary not to lose sight of the main purpose, viz., to increase our knowledge in order to assist in the diagnosis, treatment and prevention of disease. He issued a plea for a wider and more continuous application of existing knowledge to improve the health conditions in the Tropics, and for a more scientifically trained and organized service than we now possess to prevent, control and suppress disease.

Many instances could be cited of the brilliant results obtained from the practical application of our existing knowledge, such as the stamping out of yellow fever in Havana and from the Panama Canal, the abolition of malaria from Ismailia, also at Clairfond in Mauritius, its reduction in Panama, Hong Kong, India, Algiers, Italy, West Africa, Malay States, Egypt and the Soudan. There is also the reduction of typhoid fever in the army in India, and of cholera in some of the eastern towns. While allowing full credit for these and other achievements, the improvement effected among the small European communities in the Tropics is still insignificant. Little has so far been done in the reduction of the ravages of tuberculosis, cholera, plague, malaria, dysentery and other tropical diseases over which so much time and labour have been expended on discovering their cause and mode of transmission. The quarters of tropical towns occupied by the natives for whose welfare we are responsible are generally in a most insanitary state. According to Colonel King, C.I.E., the death-rate in India is more than double that of England; in 1911 fevers claimed 4,207,000 deaths, of which at least one million could be ascribed to malaria, nearly three-fourths of a million to plague, and 733,000 to cholera; in sixty-four large towns the death-rate varied from 30 to 70 per mille; and the expectation of life of the Indian male at birth was only 22·59, against 46·04 years for English males. The Indian authorities were slowly waking up from their unsatisfactory condition, and had recently

organized a sanitary service for towns and municipalities, a measure advocated just twenty years ago.

It was essential that a country which had lost eight million lives from plague in sixteen years should have a better organization to protect its peoples.

Kala-azar and Allied Conditions,

By Fleet-Surgeon P. W. Bassett-Smith, C.B., R.N.

The author applied the term Leishmaniasis to cover all forms of disease dependent etiologically on the presence of peculiar protozoal organisms known as *Leishmania donovani*, *L. infantum*, and *L. tropica*. These diseases may be divided clinically into two main groups. The first in which the diffusion of the parasites is widespread in the body and in which the constitutional symptoms are severe; the second in which the parasite causes but a local and superficial lesion without any constitutional symptoms.

He proposed to confine himself mainly to the first group. Kala-azar in India has spread in epidemic form up the Ganges Valley to the foot hills of the Himalayas and has devastated the tea plantations of Assam. It is now known that many irregular fevers previously diagnosed non-malarial remittents are in truth kala-azar. The extension of the disease eastward through Thibet into China is now recognized, the most heavily infected region being in the north-eastern part between the Yangtse and the Peiho rivers. To the west the disease extends from India to Southern Europe by way of Arabia, Persia and the Caucasus, though endemic areas are present in Central Africa, Abyssinia, the Blue Nile, Sudan and Egypt, where it has probably existed for a very long time.

Since 1905 it has been known that leishmaniasis occurs in Southern Italy and throughout the whole Mediterranean basin in a form which is particularly liable to attack young children. In the western hemisphere, so far there has been but one authentic record of kala-azar.

From a morphological point of view there appears to be no means of differentiating the parasite as it occurs in India, China, or in the Mediterranean.

The frequency of the parasite in the peripheral blood appears to vary in different endemic areas; for instance, in Madras the percentage of positive results in the hands of Patton and Donovan has been very high. The examination of blood films being a lengthy process, cultivation of the parasites in N.N.N. medium presents a much more reliable method of demonstrating their presence. It was their frequency in the peripheral blood which led Patton to believe that the bed-bug (*Cimex rotundatus*) was the definitive host of the parasite, though his discovery that ingestion of a second feed of blood within a limited time tends to cause the destruction of the multiplying organisms in the digestive tract rather seems to negative this suggestion.

The recent paper by Rogers and Dodd suggested that the infection in Assam is to a large extent a house infection. Other vertebrates in some of the endemic areas are liable to infection and serve as reservoir hosts. In India none have been demonstrated so far, but in the Mediterranean area it has been shown that dogs not infrequently harbour a similar parasite and it has been suggested by Lemaire, Sergant and Basile that fleas convey the infection from the dog to man, but the supposition is controverted by Wenyon's work. There is no doubt that dogs can be infected with the Indian virus of kala-azar under experimental conditions, yet apparently as has been stated, natural infection does not occur. As regards the flagellates normally inhabiting the intestinal tract of fleas and other insects and which may be mistaken for a stage in the development of leishmania, Bassett-Smith is inclined to agree with Wenyon that all blood-inhabiting flagellates of the typanosome group were originally parasites of the insects' gut alone, but some have adapted themselves to a parasitic life in warm-blooded animals.

There is little doubt now that the virus of the Indian and of the Mediterranean forms are identical. There is therefore no advantage in retaining more than one name for the parasite causing the generalized infection, either in the far East, India, Africa, the Mediterranean basin, or America. As regards treatment, in a case under Bassett-Smith's care on intramuscular injections of atoxyl (3 to 5 gr.) twice weekly the parasites could no longer be cultivated from splenic punctures though still demonstrable in smears. It is possible that this was due to the continuous action of atoxyl; clinically, however, no great improvement in the patient's general condition had been observed.

In old standing cases spontaneous recovery may ensue. Injections of salvarsan have so far been attended by little success.

Professor Gabbi (Rome) read a communication of the transmission of kala-azar. Basile, he said, first drew attention to the probability of the transmission of the parasite from dog to dog and to man by the agency of fleas. He proceeded on the following lines:—

(1) Healthy and leishmania-infected dogs were placed together for a space of time.

(2) Fleas removed from the infected were placed on healthy dogs.

(3) Puppies were inoculated with the intestinal contents of fleas from an infected dog.

By these means he was materially enabled to convey the infection to healthy dogs.

Wenyon carefully checked the third experiment quoted above and arrived at the entirely opposite conclusion; this was also the experience of Marshall. This anomaly Wenyon explains by the fact that Basile made his experiments in centres where spontaneous canine leishmaniasis is common and that he omitted the cultural and microscopical examination of their bone marrow before pronouncing the dogs free from infection.

Professor Gabbi related at some length two experiments based on the line of the first two experiments of Basile and his results were entirely negative. He therefore thinks that it will be necessary to discover an insect intermediary other than the dog flea.

In the discussion which followed Dr. D. E.

ANDERSON (London) remembered that uta, a curious disease in Peru, is none other than nasopharyngeal leishmaniasis. Dr. P. H. BAHR (London) drew attention to the remarkable absence of both canine and human leishmaniasis from Ceylon, a country so closely related both geographically and zoologically to parts of India.

Professor FERGUSON (Cairo) said that the existence of leishmaniasis in Egypt had so far not been substantiated. In Cairo they were familiar with an interesting form of febrile splenomegaly, in which the clinical picture resembled kala-azar, though no parasite could be demonstrated in the tissues either during life or *post mortem*. He did not consider that they conformed to the clinical type of case known as Banti's disease.

Dr. G. A. WILLIAMSON (Aberdeen) confirmed Professor Ferguson's statements; the disease he referred to was extremely frequent in Cyprus.

Captain MARSHALL, R.A.M.C., said in his experience the leishmania commonly disappeared from the spleen in the terminal stages of kala-azar, a fact he was quite unable to account for. All the experiments with insect intermediaries, including lice, had so far given negative results.

Professor GABBI (Rome) also admitted familiarity with this disease in Sicily; they were certainly not examples of Banti's disease which was non-febrile. He himself had formerly acted as assistant to Banti and was quite familiar with the symptoms of the disease which bears the name of this distinguished Italian physician. Before pronouncing a diagnosis on kala-azar it was necessary on many occasions to examine splenic punctures and even the red bone marrow as well. It was his experience also that the parasites were apt to disappear from the tissues in fatal cases. Patton's experiments on the transmission of the parasite by *Cimex rotundatus* required ample confirmation.

PRELIMINARY NOTE ON THE ANKYLOSTOMIASIS CAMPAIGN IN EGYPT.

In this paper Dr. A. F. MACALLAN (Cairo) outlined the recently organized campaign inaugurated in that country.

Up to a few months ago no serious effort to check the ravages of this disease in Egypt had yet been made.

A beginning was made in September, 1913, by the Department of Public Health on the initiative of Lord Kitchener, to investigate disease in a temporary annexe attached to the general hospitals. Subsequently it was determined to convert it into a travelling hospital in tents with beds for 100 patients, the organization of which was on lines similar to those of the travelling ophthalmic hospitals, in which the treatment is dispensed gratuitously.

In February of 1914, the director-general of the International Health Commission founded by Mr. Rockefeller, visited Egypt; as a direct result of his visit the commission has granted £6,000 per annum on the condition that a similar amount would be contributed by the Egyptian Government.

It has been decided to commence operations in the province of Shargina with a population of 879,000. The scheme is to include one large and four smaller travelling hospitals each capable of dealing with 100 patients. Up to April 30, 1914, 1,011 ankylostomiasis cases had been treated; of these 628 have been cured and 383 relieved. The absence of worms or ova from the fæces on the second day after the last dose of thymol is taken as the definition of a cure.

The scheme has been hampered so far by the lack of a skilled staff, though they will now be able to employ two medical men with a proper tropical training, and who in addition to this work will be able to pursue investigation into all aspects of this disease.

The course of treatment as outlined lasts a week. The first day is the day of admission after the discovery of ova in the excreta. No food is allowed after the midday meal. In the evening 1 oz. of sodium sulphate is given which empties the intestines. On the second day 60 gr. or 4 grm. of finely powdered thymol is given in cachets. Three hours after the thymol a second dose of aperient salts expels the worms stupefied by the drug. No oil or alcohol is allowed and only one good midday meal during treatment.

A similar line of treatment is pursued on the third and fourth days. The fifth and sixth are days of rest during which the patient has three meals a day; stools are examined for ova on the sixth morning, should they be present a second thymol course is recommenced.

By these means 70 per cent. of cases may be cured by one course of thymolization in lightly infected places; in heavily infected areas the results are not so good by 20 to 30 per cent.

The hæmoglobin percentage in the non-infected fellah varies from 40 to 80 per cent.; the average rise of hæmoglobin after treatment was 19 per cent. in one locality and 9 per cent. in another.

Out of 1,291 patients in whom the hæmoglobin was estimated, 65 had a percentage of 10 or under.

It is proposed to make an extended trial of Dr. Ferguson's method in British Guiana, by means of small repeated doses of 10 gr. of thymol on six days in the week until 100 doses have been given. This line would appear to be eminently suitable for the eradication of the disease from prisons, schools and labour gangs, but unsuitable for the treatment of a free and untrammelled adult population.

Other anthelmintics employed are sodii, β naphthol and oleum chenopodii. The action of the former is similar to, but less efficacious than thymol, whereas oleum chenopodii, given in doses of 45 minims on sugar and followed by castor oil and chloroform, was inefficient.

It is proposed to make as time permits an ankylostomiasis survey of one province at a time in order to determine the existence or absence of endemic centres, to educate the populace by means of lectures and demonstrations, and to prosecute researches into

many aspects of the disease. The common method of inspection in Egypt either by the oral or dermal route still remains to be determined. It is a remarkable fact that no cases of "ground itch" have been observed.

It is hoped that this preliminary note will at any rate demonstrate that every endeavour is being made by the Egyptian Department of Public Health, under the distinguished directorship of Sir David Semple, to make the campaign a success.

Dr. F. M. SANDWITH (London), in congratulating Dr. Macallan, described his visit to Egypt in the spring of the year. He was impressed with the interest that Lord Kitchener took in this important work. It gave him great pleasure to take part in the inauguration of a campaign which he himself (Dr. Sandwith) had suggested some years ago to Dr. Harpur in charge of a Church Missionary Society hospital in Cairo. In his experience pellagra was an extremely common disease amongst these ankylostome-stricken patients, having found that almost 50 per cent. showed obvious signs of this disease. Dr. Macallan, though professionally an oculist, was undoubtedly the right person to direct the work in Egypt. His knowledge of the language, habits, and customs of the country were invaluable. He expressed surprise at the failure of oil of chenopodin as a vermifuge in Egypt; he understood that Dr. Schaffner, in Sumatra, considered it superior to any other, a view also held by two of his correspondents, Dr. Nicoll and Dr. Linnell, in the Malay States. He suggested that perhaps the oil of chenopodium supplied to Egypt was not of the same quality as that employed in the Malay States.

Professor LLEWELLYN PHILLIPS (Cairo) said he had had good results from a mixture of eucalyptus oil, castor oil, and chloroform. From every point of view thymol and eucalyptus oil were the best vermifuges in his estimation.

A PRELIMINARY NOTE ON SECONDARY CHANGES DUE TO BILHARZIA OVA IN THE SPINAL CORD

was the title of a short paper by Professor FERGUSON (Cairo). Bilharzia ova were found widely distributed throughout the body—in the central cortex, heart, lung, liver, spleen, and kidneys, as well as in the reproductive organs. In natives of Egypt who had exhibited during life anomalous nervous symptoms, such as mono- and paraplegias, and incontinence of urine, he had found great accumulations of ova in the posterior columns and surrounding the central canal of the spinal cord, where they caused great destruction of the nerve elements. Professor Ferguson showed some microscopic specimens to illustrate his paper.

IS EMETINE SUFFICIENT TO BRING ABOUT A RADICAL CURE IN AMŒBIASIS?

In this short paper Professor LLEWELLYN PHILLIPS (Cairo) put forward a plea for a much more prolonged course of emetic treatment in amœbiasis (for three weeks or more) combined with small doses of a suitable aperient. Emetine readily destroys the amœbic or active stages of the parasite, but has no effect on the cysts; hence the patient remains a carrier and a source of danger to others, while he himself is further liable to complications and relapses. The following line of treatment is suggested: hypodermic emetine for at least ten days or longer, followed by oral administration of the same drug. This to be followed by subsequent courses at increasing intervals by similar injections interspersed with frequent doses of calomel and thymol.

No case should be considered cured until after several examinations, and no cysts of *E. histolytica* can be found in the fæces.

Drs. SANDWITH and BAHR fully concurred with Professor Phillips in his views.

Thursday, July 30.

THE EDUCATION AND POSITION OF THE SANITARIAN IN THE TROPICS.

This paper, by Colonel KING, C.I.E., I.M.S. (ret.), was read, in the inevitable absence of the author, by Dr. Cantlie. The prevention of disease in the Tropics should be more vigorously prosecuted than in England. Medical knowledge demanded a profound acquaintance with certain defined sciences largely evolved by and peculiar to medicine; it deals with man as an individual. Sanitary knowledge, on the other hand, whilst possessing a substratum of medical science, was a compound of all sciences affecting man.

The evolution of the sanitarian in Great Britain and his adaptation by special education and qualifying examinations was the result of the natural tendency to specialism of the profession. In the Tropics, on the other hand, the sanitarian was largely the outcome of special epidemic diseases and local conditions, in which the large areas to be administered and the sparsity of the European official staff had to be taken into consideration. At the present day the civil medical officer in India was a man who had qualified as a medical practitioner after five years' study, though subsequently he may study public health matters. Such a man in the Tropics had to deal successfully with mixed medical and sanitary functions. As the country concerned makes economic progress, a cleavage occurs in their duties, and a certain number form a branch of the service dealing entirely with medical, others with sanitary matters. No attempt had yet been made to produce the type of man wanted as a whole-time sanitarian in the Tropics, although the London School of Tropical Medicine recently had by modifications in its curriculum suitably approached the subject.

In the Tropics the sanitarian had not at his disposal experts in the various branches of science he utilizes.

Already proof was available as to the advantages of giving the sanitarian in the Tropics a free hand; the success of Surgeon-General Gorgas in the Canal Zone was a case in point. It was therefore necessary that in a tropical government there should be a distinct cleavage between the medical and sanitary

branches of the service. Whether the sanitary officer serves a municipality, a district, province or empire, if he be responsible for giving advice affecting public funds or interests, he should be subordinate to no other authority whatsoever than the public body or government which pays him. There should be no reason, whatsoever, why the sanitary officer should be subordinate to the chief medical officer, whose rôle should be curative medicine.

The paper was illustrated by a diagram showing how under central and provincial governments the medical and sanitary branches of a public health service can be worked. In it the several departments should be independent of each other, though co-related so as to work under a special branch of the Government termed the Ministry of Public Health and Economics. This scheme also provides for an expert sanitary engineering staff and also provincial sanitary boards, dealing in consultation with the chief sanitary officer of provincial governments with major sanitary works in urban and rural areas.

Professor R. T. SIMPSON, C.M.G., agreed to many of the points raised in the last paper, but was strongly opposed to the complete separation of a sanitary from a general medical education. He considered a primary medical training to be absolutely essential.

Dr. CANTLIE proposed and Colonel WOOLBERT, I.M.S., seconded the following resolution, which was put to the meeting and passed by unanimous consent :—

" Whilst agreeing with Colonel King in his admirable scheme for the creation of separate curative and preventive medical departments in the Tropics, this meeting considers that there should be no interference with the general education of medical students but that specialization in hygiene should be entirely a matter of post-graduate training and work."

Dr. BRUCE LOW (London) was of the opinion that without the assistance of properly trained sanitary inspectors it would never be possible to build up and maintain an organized sanitary service in the Tropics.

There were no fewer than five separate papers dealing with different aspects of sand-fly fever.

THE BIONOMICS OF THE MALTESE PHLEBOTOMI,
A Paper by Captain P. J. MARETT, R.A.M.C.,

illustrated by numerous microscopical specimens, was read by the Secretary.

The habits of the sand-fly larva, previously little understood, were dealt with in detail. They are devoid of eyes and live in dark places amongst rubbish; their food consists for the most part of the excreta of woodlice, lizards and bats. The requisite and optimum temperature for these developments is above 70° F. A certain amount of moisture appears to be essential. These necessary physical conditions are found in the interior of rubble walls, crevices of caves, and especially in Malta in the interior of the old bastions.

Three species of phlebotomus have been described by Newstead as occurring in Malta, *Phlebotomus papatasii*, *P. minutus* and *P. perniciosus*, all apparently capable of subserving as definite hosts for the virus of sand-fly fever. In Malta the flies appear about the middle of May in small numbers and gradually increase in number to the middle of June; by July fewer are to be seen, but from the middle of August to the middle of September they swarm again. The life-span of the adult fly is but a short one, on an average about seven days. The eggs, 36μ × 12 μ are white, but rapidly become darker and are marked with distinct patterns; on hatching the minute larvæ are of a dull white colour, the head and the two tail hairs being a shiny black. Increasing rapidly in size they moult once and assume two pairs of tail hairs. When about 4 mm. long they become motionless, empty the intestinal canal and pupate.

The pupa is obtectate and of a dull white colour. The imagines become sexually mature within a few hours of emergence; the maximum distance of flight in a horizontal direction is about fifty yards, though the powers of ascending vertically are limited. They are commonly attacked by an ecto-parasite a small red mite, and internally by a fungus *Empusa papatasii*.

The second paper on

SAND-FLY FEVER,
By Colonel BIRT, A.M.S.,

was also read by the Secretary. He dealt mainly with the clinical symptoms and laid stress on the conjunctival injection, and the post-ocular pain, epigastric distress, intermittent diarrhœa, epistaxis and slow pulse. The blood shows a leucopænia with a relative decrease in the polymorphonuclear and eosinophile elements. The lethargy which ensues after defervescence is a remarkable feature.

In the majority of cases the attack lasts but two days; occasionally, however, the febrile period may extend over seven days or more.

After the attack a high degree of immunity is developed. Second infections in the same individuals may occur, though they are of extreme rarity.

SAND-FLY FEVER IN CHITRAL,
By Captain GRAHAM, I.M.S.,

was the title of the third paper. The three-day fever of Chitral originally described by Macarrison in 1906, tallies in every particular with the disease in the Mediterranean basin. In the mountainous district of which the paper treats it never occurs at an elevation above 7,000 ft. The phlebotomus is represented by two species, *P. papatasii* and *P. minutus*, both of which are capable of conveying the infection. As regards racial susceptibility the Gurkhas of the hill country are more prone to contract the fever than are the natives from the hot plains of the Punjab, the majority of whom have previously suffered.

SAND-FLY FEVER IN ITALY.

Professor GALLI (Rome) read a short communication on sand-fly fever in Italy, where the disease appeared suddenly after the great Messina earthquake in 1908,

and when it was with some degree of justice dubbed by the populace "the fever of the rubbish."

The fifth paper on the same subject was designated

SAND-FLY FEVER IN PESHAWAR,

By Captain HOUSTON, R.A.M.C.

The facts recorded agreed in the main with those dealt with in the previous papers. The commonest species of phlebotomus in Peshawar is *P. papatasii*.

Friday, July 31.

THE SURGICAL TREATMENT OF COLITIS AND POST-DYSENTERIC CONDITIONS

was the subject chosen by Dr. CANTLIE for discussion. He described the anatomy, physiological and pathological conditions of the sigmoid flexure, which, though so far neglected by the profession, he regarded as a distinct and important portion of the intestinal canal; in addition to this it was one of the narrowest portions and the point at which it was joined to the rectum was by far the narrowest portion of the tube. This aperture, which was as well marked as the os uteri, he had designated the sigmo-rectal pylorus, a favourite situation of cicatricial contraction as well as of malignant disease. In post-dysenteric conditions it is always excoriated and ulcerated. For the diagnosis of pathological changes in this part the use of the sigmoidoscope was absolutely essential, any change in the mucosa of the sigmoid could thereby be readily seen. Dr. Cantlie's local treatment consists in freely applying carbolic acid, subsequently injecting a solution (1 dr. to 6 oz. water) of collosol argentum (Crookes) daily for a week and subsequently twice weekly, if necessary. Usually one week suffices for cure in the most severe cases.

Besides being of pathological the sigmoid fulfils certain physiological functions; the moment fæces impinge on the sigmo-rectal pylorus an intense desire to pass stool is experienced.

He was averse to examination by the sigmoidoscope under general anæsthesia and was convinced that the patient's own sensations were the best guide in the precaution of any accidental laceration of the bowel wall during examination. He considered the passage of the sigmoidoscope in itself as being distinctly beneficial as it tended to dilate the sigmo-rectal pylorus and thereby promote healing,

THE COMPARATIVE DISEASES OF THE BRITISH WEST INDIAN COLONIES

was the title of a paper read by Dr. D. E. ANDERSON (London) in which he compares the hospital statistics of the various West Indian Islands compiled from the Colonial Office Reports.

Dr. BAHR (London) thought it inadvisable to base any scientific conclusions on such statistics. He was convinced that diametrically opposite conclusions could be drawn from their study. Hospital statistics could be no index to the real prevalence or otherwise of various diseases in different countries.

BERIBERI, THE RICE THEORY AND RECENT CRITICISMS,

was the title of a printed communication from Drs. FRASER and STANTON (Malay States). Amongst writers on the etiology of beriberi during the last few years, they declared, there are not a few who have been unable to accept the rice theory, or as it is sometimes called the "deficiency" theory, because they believe it to be incompatible with their clinical experience. It has been stated that the diets consumed by peoples among whom they have observed outbreaks of beriberi were physiologically perfect, but it has been shown conclusively that a diet, which as estimated by the methods generally in use is physiologically perfect, can cause disease by reason of the fact that it is lacking in substances the nature and composition of which have up to the present not been determined. The evidence so far adduced in favour of regarding beriberi as a place disease, as an infection by some micro-organism, or even as an insect-borne disease could easily be disposed of. The paper terminated with an appeal to fellow-workers who as physicians have to deal with outbreaks of beriberi, and whose experience is opposed to the view that the disease arises through a defect in diet, to consider that after all beriberi is but one form of polyneuritis, a condition which may be induced by a variety of causes, and that their observations do not necessarily invalidate the conclusions arrived at in regard to the origin of the disease elsewhere. Facts rather than surmises are now necessary if they would combat effectively a theory the application of which in practice has been attended by widespread and beneficial results amongst the rice-eating people of the Orient.

Dr. SANDWITH and Professor SIMPSON regarded beriberi as the result of a one-sided diet, but thought that more attention should be paid to diseased conditions of the rice grain itself in producing the disease.

RECENT RESEARCHES ON SPRUE

was the title of a paper read by Dr. P. H. BAHR (London), which was illustrated by a number of macro- and microscopic specimens. As a result of his researches which were conducted in Ceylon he concluded that:—

(1) Sprue is a specific disease of tropical and of sub-tropical countries, though it is possible that cases occasionally do originate in temperate zones.

(2) It is a disease prevalent in Ceylon, especially among the Europeans, but, contrary to the opinion hitherto held, it may occur also in the native, irrespective of race or mode of life.

(3) This fact, together with the occurrence of the disease in people closely associated, suggests a local influence or some communication of the specific cause from man to man.

(4) Sprue is a variable disease: it may occur in a mild or as a particularly virulent form, and in common with many other serious diseases of intestinal origin, it is sometimes liable to sudden remissions and latent periods.

(5) There is evidence that the disease may occur as distinct and specific clinical forms according to the portion of the alimentary canal attacked.

(6) Researches on the composition of the stools point either to a complete absence or inefficiency of the intestinal digestive ferments; researches on the blood and urine are in favour of regarding sprue as an alimentary toxæmia.

(7) The pathological results of the investigation are also in favour of this supposition and point to an infection of the alimentary canal with the thrush fungus (*Monilia albicans*) and consequent absorption of its toxins as being concerned in the production of this toxæmia; the balance of evidence collected is on the whole in favour of rather than opposed to this view.

THE VOMITING SICKNESS OF JAMAICA

was the subject of an important paper by Dr. H. HAROLD SALT, Government Bacteriologist, Jamaica, which was read by the Secretary.

The disease is of exceptional interest, as it appears to be limited to the island. Amongst other features it has a peculiar seasonal prevalence, a tendency to attack children only, and a very high death-rate.

Since 1905 there have been several outbreaks: in 1907, 1910, 1911 and 1913. During 1913 to 1914 though only twenty cases came to Dr. Salt's notice over the whole island all but two died, a 90 per cent. mortality.

During recent years it has been suggested that it is but an undefined form of yellow fever, though this view is not shared by the local medical men.

Symptoms.—The patient, usually a child, is suddenly taken ill during the night with vomiting followed by epigastric pain and further vomiting. In a very short time convulsions ensue, soon passing into a state of coma and death. The total duration of the illness is short, the average being about twelve hours, though in rare instances the whole duration may only be half an hour. The temperature may reach 101° or 102° F. or it may be normal. Cheyne-Stokes breathing may appear. Kernig's sign may or may not be present. The pupils are equal and moderately dilated, and if the coma is not deep, react normally. There may be photophobia; delirium is uncommon.

If recovery ensues the child who has been seriously ill may be sitting up in bed after twenty-four hours and up and about again in another forty-eight.

The vomit is never "black" as in yellow fever.

Bacteriology.—In the majority of cases cultural attempts of blood and cerebrospinal fluid yield negative results, though occasionally a diplococcus which in some respects does not tally with the meningococcus can be cultivated. This coccus has been assigned by Seidelin the provisional name of *Diplococcus jamaicensis.*

Morbid Anatomy.—The most striking features are enlargement and hyperæmia of the lymphatic glands, subsericardial petechiæ, submucosal gastric hæmorrhages, necrotic foci in the pancreas, liver and kidneys, marked hyperæmia of the spinal and cerebral pia mater and intense engorgement and hæmorrhages into the parenchyma of the kidneys, liver, spleen, lymphatic glands and heart muscle. Cultures of large quantities of blood drawn from a vein during life have always proved sterile. As a result of his researches Salt made the following careful deductions:—

(1) That, in view of the sudden onset in apparently perfect health, without any prodromata, and the absence of any bacterial findings in a typical case under favourable conditions, the weight of evidence is against the disease being due to a bacteriæmia.

(2) That the rapidity of progress of symptoms with early fatal termination, or in rarer instances an equally rapid and complete recovery without deleterious after-effects, rather indicates the action of a poison.

(3) That in view of the early symptoms being gastric and cerebral, this poison is probably produced in and absorbed from the stomach; the gastric and duodenal congestion present tends to support this.

(4) That, since feeding experiments have proved negative and chemical tests have revealed none of the organic or inorganic poisons, the poison (if such it be) may be of the nature of a glucoside.

(5) That the poison spreads rapidly throughout the whole body, as is evidenced by the hæmorrhages and other changes present in almost every organ and tissue.

(6) That it produces its effects mainly upon the liver, as is evidenced by the extensive fatty changes found in that organ.

(7) That considering the enormous death-rate (90 per cent. of the cases reported this year), the first indication for treatment which can be deduced from the above lines—for it is little more than theory and conjecture based on observed facts—until the poison is isolated and its antidote found, is to wash out the stomach at the very earliest opportunity.

Dr. SANDWITH proposed and Dr. CANTLIE seconded the following congratulatory message, which was despatched by the meeting and greeted with applause by all present:—

"The Section of Tropical Medicine assembled in Aberdeen in connection with the British Medical Association Meeting, July, 1914, sincerely regrets that, owing to his state of health, it was impossible for Sir Patrick Manson, G.C.M.G., F.R.S., to be present. Members of the Section feel that they would be voicing the opinion and desire of medical men attending the Conference were they to communicate to Sir P. Manson their deep regret at the cause of his absence, and also that, as a graduate of this University, they were unable personally to have the benefit of his company at the sixteenth meeting of the Section of which he was the first President. The Section wishes to communicate from the city, his professional birthplace, the testimony of admiration for the great benefits Sir P. Manson has, by his work, conferred upon humanity, and hopes that he may very soon be restored to vigorous health, and may long be spared to guide by his advice the advance of tropical medicine."

The proceedings terminated with a vote of thanks to the President, Professor R. T. Simpson, C.M.G., and the energetic Secretary, Dr. G. R. Williamson.

Abstracts.

ELEPHANTIASIS AND THE KONDOLEON OPERATION.[1]

By HUBERT A. ROYSTER.

A MULATTO, aged 23, born in Virginia. Later he moved to South Carolina, his present home. During the summer of 1911 his right leg and foot began to swell, following an acute attack, accompanied by pain, redness and fever. In the winter months the condition improved, but each summer the swelling, pain and fever returned. The leg has steadily increased in size until it seriously interferes with his occupation. Locomotion is difficult and wearing of ordinary trousers impossible.

The enlargement was confined to the right leg and foot and did not extend above the knee. The circumference at the calf was 22 in., above the ankle 18 in. and of the foot 14 in. The skin was exceedingly hard, thick and rough; in some portions it was scaly, in others horny; at the bend of the ankle there was a wide fold which prevented proper motion of the joint,

Detailed investigation elicited the following: The Wassermann reaction was negative; repeated study of the blood, taken at various hours of night and day, and continued over several weeks, showed no filariæ; at one time a decided eosinophilia (11·2 per cent.) was present; the urine was normal. The eosinophilia was most probably due to an accompanying hookworm infection, as the eggs were found in the fæces.

It was decided to do the Kondoleon operation. For four days previous the man was put to bed; each day the leg and foot were scrubbed in a strong mercuric chloroid solution, bandaged tightly with a Canton-flannel roller and kept elevated on pillows. As a result of this, the leg was reduced in size about 2 in. January 3, 1914, the operation was performed as follows: A long incision was made through the skin on each side of the leg, extending from knee to ankle. Wide retraction of the integument was secured by dissecting it back freely from each edge of the incision. Going from above downward, the deep fascia to the width of three fingers was dissected off the muscles and cut away in one piece of the length of the wound. Also, the same area of subcutaneous tissue was removed by splitting it off the skin. The muscles were laid bare and free hæmorrhage occurred, requiring many ligatures. The skin was stitched back in position, dressings applied and the leg bandaged without a splint.

One week later the first dressing revealed primary union, except at the lower third of the incision on the outer side of the leg, where sloughing of the skin edges had occurred. Undoubtedly too much of the subcutaneous tissue had been removed, leaving the skin at that point thin and poorly nourished. The whole leg was very much smaller (17 in. at the calf) and the ridge across the ankle had disappeared. One month afterward further progress was evident: the leg had diminished in size, the foot was much more flat and the patient could walk with comparative ease. At the present time (April 23, 1914) the improvement is still evident; there has been no going back. The patient is able to get about and will probably take up his work in a short while.

The auxiliary treatment consisted, first, in the hypodermic administration of thiosinamin (fibrolysin) every three days over a period of two weeks while the patient was in bed. On two occasions a marked reaction resulted from an ordinary dose and it had to be given in smaller quantities. Then on April 10, an intravenous injection of salvarsan was given empirically, for the purpose of combating the possible parasitic or microbic origin of the disease, in spite of our inability to demonstrate the presence of any infective organism. Since the injection the eosinophiles have reduced to 6 per cent. It is too early to predict the final result.

Kondoleon's operation was evolved from the idea of Lanz, of Amsterdam, who referred to his procedure as a "deep lymphatic derivation." But Lanz's operation is technically difficult, while the operation method offered by Kondoleon is simple. The principle involved is that, by removal of the deep fascia, there is brought about an anastomosis between the deep and the superficial lymph-spaces. The operation is new and has not been performed in a sufficient number of cases to warrant any definite opinion; Kondoleon himself has done it but six times, and, though his reports were favourable, only two months had elapsed since the last operation.

Now, more than three months after the operation, the measurements of the affected leg are; Calf 15¼ in., above the ankle 15½ in., and foot 13¼ in. The sound leg shows the following: Calf 15½ in., above ankle 10½ in. and foot 10½ in. It will be noticed that very little decrease has been secured in the size of the elephantiasic foot, and a similar operation in that region is proposed as the next step, provided it could be done without damage to the tendons. The skin over the whole leg is much smoother and quite movable over the underlying tissues.

[1] From the *Journal of the American Medical Association*, May 30, 1914.

A SOLITARY OBSOLESCENT PELVIC HYDATID.[1]

By A. CAMPBELL MAGAREY, M.S., M.R.C.S.

Demonstrator of Anatomy, University of Adelaide.

A MALE anatomical subject was aged 67 at time of death. There was no information concerning symptoms during life.

When the abdomen was opened the bladder was seen to be distinctly enlarged and thickened, and a hard tumour observed situated in the middle fossa of the pelvis, between the bladder and the rectum. The ureters were much dilated, as was the pelvis of each kidney, and, when opened, there was evidence of ureteritis and pyelitis respectively. The bladder wall

[1] From the *Australasian Medical Gazette*, May 19, 1914.

was considerably thickened, and the inner aspect showed marked sacculation.

The dimensions of the tumour were: antero-posteriorly, 2¼ in.; vertically, 2¼ in.; transversely, 3⅞ in. The tumour was slightly larger on the left, though it extended across the pelvis. The prostate was not enlarged; the rectum was dilated above the tumour.

Though a routine complete anatomical dissection was made, no further evidence of hydatid disease was discovered. When opened, the tumour was found to consist of a thick ectocyst with intramural calcareous deposits, and within this membranous folds of gelatinous consistency, between which folds lay the typical caseous material, characteristic of a dead or dying hydatid.

The point of particular interest in this case is the occurrence of a solitary cyst in the lowest part of the peritoneal cavity, and it would appear to be either the sole survivor of a multiple infection, which has escaped destruction by the tissues, or else an instance of a single infection through the wall of the alimentary canal, which has gravitated, as occurs with cancer cells, to the most dependent part of the peritoneal cavity.

THE USE OF LIQUID PARAFFIN IN ENTERIC FEVER WITH CONSTIPATION.

By Llewellyn P. Phillips.

In Egypt it is the exception to see cases of typhoid fever with diarrhœa. Constipation is the rule, and this constipation is often very difficult to manage. In cases in which during former acute illnesses enemata have acted with the greatest difficulty, paraffin, if an enema is necessary, acts easily and painlessly, and both my patients and the nurses have been more than satisfied with the result. It seems absolutely free from risk and, further, it probably acts as an emollient dressing to the typhoid ulcers. The only disadvantage from its use during typhoid fever has been a little occasional leakage per anum.

The dose is half an ounce at night and, if this be not sufficient, a dose of half an ounce in the morning as well; it is best taken floated on the top of a little soda-water. With such dosage enemata are often unnecessary, though still often the bowel has to be washed out so as to remove as much toxic material as possible.—*Lancet*, July 25, 1914.

Reviews.

Tropical Diseases. A Manual of the Diseases of Warm Climates. By Sir Patrick Manson, G.C.M.G., M.D., LL.D.(Aberd.), &c., with 12 colour and 4 black-and-white plates and 239 figures in the text. Fifth Edition, revised throughout and enlarged. Cassell and Co., Ltd., London, New York, Toronto and Melbourne. 1914. 12s. 6d. net.

One can only treat with reverence everything that issues from the pen of the Nestor of tropical medicine. This, the fifth edition and fourteenth reprint, contains the most recent points in tropical medicine, and to mention a few of the recent advances one can enumerate: (1) The discovery that kala-azar, especially the infantile form, is a not infrequent disease in the countries surrounding the Mediterranean Sea, and also elsewhere in tropical and sub-tropical countries, that it is intimately associated in many of these countries with the dog, and that peculiar forms of dermal leishmaniasis are to be found in South America. (2) The transmission of *Trypanosoma gambiense* by *Glossina palpalis* is not, as was supposed, a simple mechanical process, but, as Kleine has shown, involves a necessary biological evolution in the insect. (3) That a peculiarly virulent form of the trypanosome occurs in Rhodesia, which is transmitted by *G. morsitans*. (4) There exists in South America a form of trypanosomiasis which is transmitted by *Lamus megistus*. (5) A specific form of three-days' fever is caused by an unknown germ introduced into the human subject by the bite of a phlebotomus. (6) As Castellani has pointed out, yaws is produced by a spirochæte closely resembling that of syphilis. (7) Beriberi, at all events in the Malay States, is the result of a diet of over-milled rice, as indicated by Braddon, and proved by Fraser and Stanton. (8) A non-periodic variety of *Filaria bancrofti* especially common in the Pacific Islands. (9) That *Schistosomum japonicum* is by no means an uncommon parasite in large districts of China and Japan which gives rise to a deadly disease, and that it is acquired by contact with the water of certain districts. These, and many minor discoveries made within the last few years, testify to the activity in pathological research into tropical disease, and the necessity for a thorough revision of the manual.

The author points out that, whilst tropical pathology has been so actively and successfully studied, the prevention and treatment of tropical diseases have not been neglected, and in the case of more than one disease investigation in these directions has had most gratifying results. To mention but a few, he points to the prevention and treatment of beriberi on the lines indicated by the discoveries of Braddon, Stanton, and Fraser; the treatment of yaws and relapsing fever by salvarsan; the treatment of trypanosomiasis by antimony; and, perhaps the most important of all, the substitution of emetine for crude ipecacuanha in the diagnosis and treatment of amœbic dysentery and amœbic abscess of the liver.

One cannot criticize the print or illustrations of the work, but might suggest that in the next edition of over 1,000 pages it should be divided into two volumes and perhaps the pages made a little larger.

Manual of Diagnostic Bacteriology. Manuel Pratique de Diagnostic Bactériologique et de Technique Appliquée à la Détermination des Bactéries. Par R. le Blaye et H. Guggenheim. Vigo Frères, Editeurs, 23, Place de l'Ecole-de-Médecine, Paris. 1914. Prix 8 francs.

This is a manual upon distinctly novel lines for all kinds of laboratory workers, especially research

workers. One hundred and sixty-three pages of this book are devoted to the methods of culture preparation, isolation of bacteria, microscopic investigation and inoculation.

A special feature of the work is its forty-seven tables on the plan of those used in practical chemistry, which, as a new departure in bacteriology, should be as useful as the practical chemistry tables themselves.

The fourth part consists of those bacteria which up to the present have been incompletely investigated. Fifty pages are devoted to the index with an extremely full bibliography alluding especially to each preparation arranged alphabetically, and the table contents is extremely clear.

The work bids fair to be useful to teachers and students of bacteriology in human, veterinary and vegetable pathology, particularly to research workers out of reach of a very up-to-date library.

Notes and News.

THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION AT SAN FRANCISCO IN 1915.

THE completion of the Panama Canal is as much a monument to the science of medicine and sanitation as it is to that of engineering. It is therefore fitting that the Panama-Pacific International Exposition, which opens its gates on Saturday, February 20, 1915, to celebrate this event, should accord signal honours to the science and practice of medicine.

The Medical Corps, under Lieutenant-Colonel W. C. Gorgas, made the building of the canal possible. The engineering corps headed by Colonel George W. Goethals completed the achievment.

Among the 227 congresses and conventions which will meet at the Exposition, the American Academy of Medicine, the National Hygiene Commission and the International Association of Nurses, with 6,000 delegates, will occupy commanding positions.

General Loynaz Castillo, Cuban Commissioner to the Exposition, announces that his government in 1915 will show how the experience of the United States Army in Cuba made possible the Panama Canal. Modern hospital wards, as conducted in the tropics, will be an important part of the exhibit in the Social Economy Section. A mosquito as large as an ostrich will be in the Cuban exhibit intended to demonstrate the dangers of the mosquito. This exhibit, upon which Cuba will spend more than a quarter of a million dollars, is to be prepared by Philip Rauer, probably the world's greatest manufacturerer of wax and glass models and a scientist of great learning.

Argentina, Japan, France, Germany, the Philippines and thirty other countries will be well represented and the most important of the welfare, civic and health exhibits from the Lyons Urban Exposition, 1914, will be brought to San Francisco, as well as the entire British exhibits shown at Ghent last year.

In addition to the governmental and state exhibits there will be unexampled health and human welfare displays by such organizations as the American Steel Corporation; the General Electric Company, with appliances for conserving the health of factory employees; the Rockefeller Foundation, which will concentrate on the measures to eradicate the hookworm; the Russell Sage Foundation, Carnegie Institutions and the Social Survey.

The American Academy of Medicine, the National Commission of Mental Hygiene, five organizations of eye, ear, nose and throat specialists, various societies for the elimination of tuberculosis, cancer, and other diseases will be a few of the many to meet in San Francisco next year.

The Panama-Pacific Dental Congress will bring more than 3,000 delegates with a clinic of more than thirty chairs. The Red Cross Association of America, the American Nurses' Association, and the National League of Nurse Education will meet with their thousands of delegates, as well as the International Congress of Nurses and the National Organization of Public Health Nurses, which will bring an elaborate series of exhibits including late hospital equipment, model wards, a Florence Nightingale exhibit and a model mortuary as developed in Europe.

One of the interesting features to surgeons and medical men and women will be the model emergency hospital. This has been in operation for many weeks and constitutes one of the many working exhibits. It is in charge of Dr. R. M. Woodward, of the United States Marine Hospital, San Francisco.

The hospital includes model automobile ambulances, a sterilizing room, X-ray room, library, operating chairs, surgical instruments and equipment and a drug room. It is in the service building of the Exposition, at the entrance to the grounds. P. Blakeston and Son, Meiecke and Co., D. Appleton and Co., Schiedel Western X-ray Company, Bausch and Lomb Optical Company, N. B. Saunder and Company, American Sterilizer Co., and the Victor Electric Company have all given their wares for the use of the hospital.

In the Palace of Liberal Arts, medicine and surgery will be treated in thirteen separate classes, instruments for work in anatomy, histology and bacteriology, apparatus for sterilizing instruments and wound-dressing appliances will be shown. Other features in this line will be: instruments for special and general medical research; instruments and apparatus in therapeutics, surgery and dentistry; X-ray apparatus; electric sterilizers and ozonizers; appliances for the use of the infirm, of invalids and of lunatics; apparatus for plastic and mechanical prosthesis; orthopædic apparatus; apparatus for hernia; instruments and apparatus used in the practice of dentistry; chests and cases of instruments and medicines for the use of army and naval surgeons; appliances for rendering aid in case of accidents, and to the wounded on the battle-field; ambulance service; appliances for rendering aid to persons apparently drowned or asphyxiated; instruments and appliances for veterinary surgery; and equipment used by druggists and pharmacists.

Original Communications.

TINEA CAPITIS TROPICALIS IN THE ANGLO-EGYPTIAN SUDAN.

By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.,
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AND
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Introductory.—So far as we are aware no researches have hitherto been made to differentiate the form of *Tinea capitis tropicalis* found in the Anglo-Egyptian Sudan. Thanks to the kindness of Mr. James Currie, C.M.G., Director of Education, Mr. M. F. Simpson, the Assistant Director, and other officials of the Department of Education of the Anglo-Egyptian Sudan, we have been able to begin the study of this rather complicated subject, to which we desire to draw attention, as it is either entirely or almost entirely omitted in works on tropical medicine.

Up to the present we have found only one species of the genus *Trichophyton* and, as this appears to differ somewhat from those usually described, we venture to bring forward the following remarks.

History of Ringworm in the Tropics.—Celsus in the second chapter of the sixth book of his "De Medicina" gives an account of ringworm of the head under the name "Porrigo." His words are: "*Porrigo autem est, ubi inter pilos quædam quasi squamulæ surgunt, eæque a cute resolvuntur; et interdum madent, multo sæpius siccæ sunt.*"

Bishop Fortunatus, who lived in the sixth century A.D., uses the name "Tinea" in the following passage: "*Lavans capita egenorum, defricans quicquid erat, crustam, scabiem, tineam nec purulentam fastidiens.*"

In the tenth century Ali ben Abbas (often written Haly) who lived in Persia, described the complaint under the terms "sahafati" and "alvathim."

The Anglo-Saxons applied the word "teter" to any kind of skin disease which itched, and in this form it was used in middle English. In the fourteenth century Guy de Chauliac wrote a work on surgery in which he used the word "*teigne*," deriving it from "tenir."

With the advent of printing it was called "tetters" in England (*vide* Langham's "Garden of Health," 1633), but in or before the sixteenth century the word "Ringworm" (*vide* Levins or Levens, "Manipulus Vocabulorum," London, 1570) had appeared for the disease Tinea circinata. In 1695 Willis in his "London Practice of Physick" devoted a chapter to the subject of the running scab, tetter or ringworm.

With a history such as this it is not astonishing that the early English writers on tropical medicine refer to the same disease as seen in tropical countries.

Thus in 1766, in his work on the diseases of Barbados, Hillary says that it was noticed by the first voyagers to the West Indies, and that it probably is the same disease as that called by the natives "cowrap." He gives a good clinical description of Tinea circinata as he saw it in Barbados, and he is supported by Wright ("Essays on the Malignant Fever of the West Indies"), who stated that it was common in Jamaica.

Winterbottom in 1803, under the term "Herpes," describes the disease in Sierra Leone, calling it serpigo, ringworm or tetters, and distinguishing it from kra-kra.

So far it would appear as though only the body ringworm or Tinea circinata was meant by the terms "tetters" and "ringworm," but in 1817 Bateman, the pupil of Willan, who completed his master's great work on skin diseases, published an atlas on the same subject, in which Plate XXXIX induces Sabouraud to believe that he recognized the identity of the two conditions. In 1824 Plumbe showed that inoculation of ringworm of the scalp would cause ringworm of the body and *vice versa*.

These publications appear to have stirred the practitioners of the Tropics to study the disease, as it was described in India by Young, in 1826, and in the Malay Archipelago by Lesson, in 1829.

In 1832 Alibert published the first edition of his celebrated "Monographie des Dermatoses," which stimulated the continental medical mind of the day, as is reflected by Smith's description of the disease in Peru, in 1840, and Pruner's in Egypt, in 1847.

In 1842 Gruby, who had already repeated Schoenlein's observations on the parasite of Favus, discovered a new cryptogam in Tinea barbæ, which was an Ecto-Endothrix.

In 1843 he found *Microsporum audouini*, and six months later, on April 1, 1844, he described an endothrix as the parasite of Herpes tonsurans. It is, however, but just to state that, without Sabouraud's generous treatment, much of Gruby's work might have been permanently overlooked.

In 1845 Malmsten gave the name of *Trichophyton* to the parasite of Tinea tonsurans.

It is asked that the reader will kindly observe the spelling of the names of these two genera. Gruby called the one *Microsporum*, not Microsporon, and Malmsten named the other *Trichophyton*, not Trichophytum.

These researches naturally aroused much interest and in 1855 Heymann showed that the disease existed in the East Indies, but it is noticeable that he makes no mention of observing a parasite in the affection.

In 1874 Blanc described the occurrence of the disease in Abyssinia where Merab states that it is very common, and where it is treated by the juice from the fruits and leaves of *Bryonia deoïca* and by tobacco powder as well as by sulphur ointment.

In 1872 the Army Sanitation Commission induced the British Government to instruct Tilbury, Fox and Farquhar to obtain a better knowledge of the endemic skin diseases of India, and to bring about an agreement between the profession in India and England as to nomenclature, typical characters, varieties and probable causes of these diseases. Thanks to the interest of Lord Granville, Lord Kimberley and Sir Alexander Armstrong, this inquiry was extended to

China, Japan, Egypt, Algeria, the West Indies and Honolulu, and the finished report was published in 1876.

The net result of this inquiry as far as ringworm was concerned was unfortunate, as it led to the dogmatic assertion that the ringworm of the body in the Tropics was the same as that of temperate climes.

In 1873 van Leent drew attention to the large number of cases of ringworm of the head in Chinese in the Island of Banka, in Malaysia.

In 1878 Corre gave a description of the disease and its parasite as seen in Nossi-Bé.

From 1890 the possibility of plurality in the species of Trichophyton was raised, but it was not until Sabouraud in 1892 began those brilliant researches which he has carried on to the present day that this was definitely established. In this year he showed that ringworm of the scalp could be divided into two main groups, viz., those with small spores belonging to the genus *Microsporum Gruby 1843*, and those with large spores belonging to the genus *Trichophyton Malmsten 1848*. The large-spored fungi of the scalp he divided into five species which were afterwards named T. crateriforme, T. acuminatum, T. gypseum, T. violaceum and T. rosaceum.

In 1893 he further divided the Trichophytons into two groups which he named Endothrix and Ecto-Endothrix (Ectothrix) and which corresponded with Gruby's two divisions. His researches were speedily confirmed by many observers, among whom may be mentioned Adamson, Colcott-Fox, Malcolm Morris, White and Mibelli.

In 1900 Matruchot and Dassonville showed that the Trichophytons were closely allied to the Gymnoascaceæ and that *Ctenomyces serrata Eidam 1880* when injected into animals produced a Trichophyton-like mycelium and eruption.

The further history may perhaps be better discussed according to the countries:—

Brazil.—The history of ringworm in Brazil appears to date from the appearance of Silva Araujo's "Atlas des Maladies de la Peau," which contained an account of Favus and of a Trichophyton causing Sycosis, both supported by microscopical observations.

Later Fernando Terra grew *Achorion schoenleini* from an atypical case of Favus and some form of fungus from a case of Tinea capitis tropicalis which was traceable to infection from a cat and was therefore probably *T. felineum*. The sixth Brazilian Congress of Medicine and Surgery, held in 1907, is remarkable for the appearance of papers on ringworm in which the parasitic fungi were studied according to Sabouraud's classical methods. It was at this meeting that Rabello announced that he had found *T. violaceum*, *M. audouini* and *M. lanosum*.

In 1909 Lindenberg reported the presence of *T. sabouraudi*. Horta announced that *M. felineum* had been found in a considerable number of cases at São Paulo, and also isolated *T. album* Sabouraud 1907.

In 1911 Horta discovered *M. flavescens* and in 1914 he found a new Trichophyton which was subsequently described and named *T. griseum* by Vasconcellos.

Argentina.—In 1907 Uriburu discovered *M. fulvum* and in 1909 *T. exsiccatum* and *T. polygonum*.

Central America.—In 1913 Brumpt named a peculiar parasite, discovered by Darier in a Dermatosis resembling Pinta, *T. carateum*. This disease was found in Central America.

Africa.—In 1896 Courmont described two forms of Tinea capitis tropicalis seen in Senegal, but these will be dealt with in the section on "Diagnosis" (which see).

In 1902 Bodin found *T. violaceum* in North Africa.

In 1904 Jeanselme announced that Courmont had found *M. audouini* among the negroes of Senegal and that Sabouraud and himself had found a Trichophyton (subsequently named *T. circonvolutum* by Sabouraud in 1909) in white people returning from the Western Soudan.

In 1912 Joyeux discovered *T. soudanense* in the Western Soudan.

Ceylon.—In 1905 Castellani discovered *T. violaceum var. decalvans* in Tinea capitis tropicalis, *T. macfadyeni* in Tinea corporis tropicalis, and *T. blanchardi* in Tinea sabouraudi tropicalis, a term also used for the disease caused by *T. circonvolutum*.

In 1908 he observed *T. ceylonense* in cases of Tinea nigro-circinata.

In 1912 he found *T. nodoformans* in Tinea barbæ tropicalis and in Tinea ciliorum.

Tropical Queensland.—In 1914 Priestley discovered *M. scorteum* in Tinea corporis tropicalis.

This brings the history of the parasites found in Tinea capitis tropicalis and the allied diseases of Tinea barbæ tropicalis and Tinea corporis tropicalis down to the present day.

The fungi at present recognized to be causal agents of Tinea capitis tropicalis are:—

Genus *Microsporum* Gruby 1843.

(1) *M. audouini* Gruby 1843, found in Brazil, Senegal, the Western Sudan and Madagascar.

(2) *M. fulvum* Uriburu 1907, found in the Argentine.

Genus *Trichophyton* Malmsten 1848.

(1) *T. circonvolutum* Sabouraud 1909, found in the Senegal and Dahomey.

(2) *T. exsiccatum* Uriburu 1909, found in the Argentine.

(3) *T. polygonum* Uriburu 1909, found in the Argentine.

(4) *T. sabouraudi* R. Blanchard 1895, found in Brazil.

(5) *T. soudanense* Joyeux 1912, found in the Western Sudan.

(6) *T. violaceum* Bodin 1902, found in North Africa.

(7) *T. violaceum varietas decalvans* Castellani 1905, found in Ceylon.

In addition Courmont's two ringworms found in Senegal, but with unnamed, and at all events in one case, imperfectly differentiated parasites must be remembered.

It may, perhaps, be advisable to state that the Western Sudan is quite different geographically from the Anglo-Egyptian Sudan. The Western Sudan, as used here, refers to the Haute-Guinée.

Geographical Distribution.—The variety of Tinea capitis tropicalis which we are about to describe has only been observed by us in Omdurman and Khartoum in the Anglo-Egyptian Sudan.

Sex, Age and Racial Distribution.—So far we have only observed it in boys and youths about 10 to 16 years of age. All our patients have been Sudanese.

Etiology.—If the head of a patient is examined it will be observed to show one or more white patches (figs. 1, 2 and 5). If one of these be investigated it will be noticed that it is composed of white scales, of normal hairs, and of hairs broken off about a millimetre above the surface of the skin (if a lens is used and fig. 2 is examined, these features will be seen).

If now one of these broken hairs is removed and soaked in 40 per cent. caustic potash for some hours, it shows very distinctly rows of so-called spores (fig. 6) inside the shaft of the hair; but none are to be seen in the sheath or the cortex of the hair. These so-called spores are arranged in regular ladder or ribbon-like chains (fig. 6) which resist the action of caustic potash and, therefore, this mycelium may be termed resistant. This arrangement can be well seen by making a lateral fracture of the hair (fig. 6) as well as by examining the shaft. The individual spores are usually quadrangular in shape, double contoured, with an average measurement of about 4·2 microns in breadth.

The rows of hyphal segments (so-called spores) divide dichotomously, a condition which can be readily seen if the hair is teazed out or broken across. Sometimes the hair is quite filled with longitudinal rows of these hyphal segments which project beyond the broken end of the shaft as clear whitish quadrangular spore-like bodies in chains which may show the commencement of dichotomous division, thus producing rather a pretty effect with the black hair.

When scrapings from the scalp, *i.e.*, the white scales, are treated with caustic potash and stained by Adamson's method chains of so-called spores may be seen (fig. 3) and more rarely elongated hyphæ, ending in a chain of the so-called spores or short lengths of hyphæ with elongated cells.

In our experience the best method of colouring fungi is by vital staining, but, failing this, Adamson's or the Oxford method is excellent, the latter being preferable for spores.

We use Adamson's method of staining rather differently from the original; our plan is as follows:—

(1) Soak the scales or hairs in 40 per cent. caustic potash solution in a covered watch-glass for some hours. In Khartoum cold weather, *i.e.*, about 90° F., we place the watch-glass in the incubator at 40° C.

(2) Transfer the specimens to another watch glass with 15 per cent. alcohol for half an hour.

(3) Transfer to a slide and, after evaporation of the spirit, dry over a flame.

(4) Stain with aniline gentian violet solution for thirty minutes.

(5) Treat with Gram's iodine solution for three minutes.

(6) Decolorize in aniline oil for half an hour.

(7) Stain with concentrated alcoholic solution of eosin for one minute.

(8) Wash off the excess of eosin with aniline oil, or, in the case of hairs, preferably with clove oil.

(9) Treat with xylol.

(10) Mount in Canada balsam.

By this method the hyphæ and spores may be Gram positive if young and Gram negative if old.

The so-called spores (hyphal segments) show up well in the superficial layers of the epithelium of the scalp, or inside the shafts of the hairs.

With regard to obtaining pure cultures, we found that the best method was to apply absolute alcohol to the scalp and to allow this to evaporate and then to remove an infected hair, or to make a scraping from a white patch. The hair or scraping was then placed in beer wort, when puff-balls, which could easily be subcultured, quickly began to appear.

On only one occasion were we able to grow the fungus absolutely pure by direct inoculation of a solid medium from the scalp; generally some coccus or bacillus appeared along with the fungus when grown in this manner.

The Trichophyton grew well aërobically at 20° and 34° C. and quickly at 37° C. but not so well at 40° C. It did not grow under anaërobic conditions.

The following are the results which we have obtained in various media:—

Liquid Media.—It is advisable to begin cultivation in an acid liquid medium such as beer wort, and later to subculture into glucose peptone containing 4 per cent. of sugar and 1 per cent. of peptone, or in ordinary bouillon with − 10 reaction.

In all of these media it grows in the form of puff-balls with a distinct centre from which the hyphæ radiate. At a very late stage of the growth, the white hyphæ often form a layer just below the surface of the medium.

Milk is not coagulated nor is acid produced, but a growth forms on the surface which bleaches litmus milk in that situation, giving rise to a white skin under which the blue litmus milk remains untouched.

It forms neither acid nor gas in the following sugar starch, alcohol-peptone media: *Monosaccharides:* glucose, lævulose, galactose, mannose, arabinose and xylose; *disaccharides:* maltose, lactose and saccharose; *trisaccharide:* raffinose; *polysaccharides:* dextrin, inulin, starch and glycogen; *glucosides:* amygdalin, salicin, helicin and phlorrhizin; *alcohols; tetrahydric:* erythrite; *pentahydric:* adonite; *hexahydric:* dulcite, isodulcite, mannite, sorbite and inosite.

Solid Media.—It is not easy to work with gelatine in a place with a daily maximum air temperature varying from 108° to 110° F. and rising at times to 115° F., but, by the aid of the native burma, *i.e.*, a large earthen vessel which allows water contained therein to evaporate freely, thus producing an internal temperature of 20° C., we have been able to use gelatine of 30 per cent. strength. In removing a tube for examination, it is necessary to place it immediately in a glass vessel containing cool water, from which it is only taken for a few moments at a time.

It is extremely difficult to obtain photographs of these gelatine cultures and hence only one (fig. 16) is shown, and this is only five days old. The technique is to first prepare the whole photographic apparatus, the focusing being performed by means of a similar agar growth. The gelatine culture, which has been kept for some time in ice-cold water, is rapidly placed in position, the final focusing is speedily performed and the photograph taken as quickly as possible.

We give these practical details because, in every tropical climate we have lived in, we have been able, so far, to use gelatine successfully.

On *Sabouraud's maltose proof gelatine* at 20° C. a minute white knob appears at the end of one day, which, at the end of two days, has became larger, and in three days has developed into a well defined round knob, which in four days is surrounded by a white plate. On the fifth day (fig. 16) the knob becomes more acuminate and resembles a little hill on a white plateau ending in a slight fringe.

On the seventh day the only point to be remarked is the increase in area of the growth, which, on the eleventh day, reaches the margin of the tube, after which it grows up and down the medium and attempts to extend on to the glass.

The growth on *Sabouraud's glucose proof gelatine* at 20° C. resembled the above except in minor details; thus, when at its best, it showed a small central knob situate on a white area which had two very slightly elevated rings, one external to the other, and then a broad radiation.

On *Sabouraud's maltose agar* it grew very well at 34° or 37° C., but much more quickly at the latter temperature. It began as a white knob, which rapidly increased in size and was surrounded by a white plateau in two days (fig. 12). In four days the only changes were the larger central knob and the appearance of an elevated ring (fig. 13) and a slight outer fringe. In seven days the growth was much larger and two concentric rings were visible. The portion internal to the inner ring and surrounding the central knob had become thinner and the dark coloured medium showed through the white area, which therefore appears rather darkish (fig. 14). The whole area is surrounded by a very slight fringe.

For comparison we reproduce in fig. 15 a similar growth of five days' duration on Sabouraud's maltose agar, but grown from another case and with atmospheric temperatures about 112° to 115° F. It resembles figure 13, but is slightly more advanced. It shows a central knob with indications of the two concentric rings and the slight fringe.

After seven days the growth extends to the margin of the flask or watch-glass. When this occurs, or slightly earlier, four or more slight grooves and ridges may appear running outwards from the central knob. These grooves and ridges are shown beginning in fig. 15.

In old cultures, chlamydospores, intercalary (fig. 10), and terminal can be seen, as well as lateral conidia (fig. 11) which are situate at slight distances from one another and on either side of the hypha. They are not very numerous. Septate spindle bodies can be found, but require to be looked for.

On *Sabouraud's glucose agar* it forms a central knob, a white plateau with a slight circle, and a small fringe (*vide* fig. 17), which is a five days' growth.

With regard to the photographs on maltose and glucose agar we have found it convenient to use the apparatus shown in fig. 7, viz., half a sterilized Petri dish carrying an originally sterilized watch-glass containing the inoculated medium, which is covered by an ordinary sterilized filter funnel fixed to the Petri dish by means of sterile vaseline and with its terminal aperture closed by a sterile cotton-wool plug. If care is taken the watch-glass can be removed and photographed and replaced without contamination occurring, and therefore, the same growth can be easily photographed at different stages.

On carrot at 32° C., the fungus forms a small white puff-ball in twenty-four hours, which, in two days, becomes surrounded by a circular whitish area having a silky appearance. On the third day the white growth is elevated at its periphery. The fourth day shows a characteristic appearance, viz., a small central white elevation surrounded by a larger dark area depressed into the substance of the carrot. This area is surrounded by an outer white line (fig. 8).

On potato it forms in twenty-four hours at 32° C. a slight stain, rather difficult to see, which, when examined by means of a lens, shows a central inoculated area from which branching hyphæ are extending in all directions. In two days the area is more distinct and white or greyish-white in colour; later, the greyish-white growth becomes more distinct and, finally, it covers the potato with a growth which gradually becomes greyish-black.

On beet-root it forms a white growth, without characteristic appearances.

On Buchanan's medium and Loeffler's blood serum it also grew, but only very feebly, showing a small white central elevation surrounded by a white plateau.

Animal Inoculations.—In regard to animal inoculations, we have obtained negative results with inoculations direct from a patient's head into a monkey, a cat, a dog, and a white mouse, and also with inoculations of cultures into another series of animals of the same species.

Classification.—For reasons which we hope to deal with in another paper, we have come to the conclusion that this fungus belongs to the class of the *Fungaceæ* of Linnæus called *Ascomycetes* by De Bary, which includes Brefeld's hemi-ascomycetes, unless this is taken as a separate division, in which case the fungus in question would belong to this division.

It also belongs to the family *Gymnoascaceæ* Zopf 1885, and to the genus *Trichophyton* Malmsten 1848, which Matruchot and Dassonville have already demonstrated to belong to this family. It comes under Malmsten's genus *Trichophyton* because—

(1) It is parasitic in hairs and in the skin.

(2) Its hyphal segments (so-called spores) are large, 4·5 μ in diameter.

(3) In cultures it possesses conidia on short conidiophores (fig. 11).

(4) It possesses spirally curved hyphæ (fig. 9).

It belongs to the division of the genus Trichophyton called Endothrix because it develops solely in the interior of the hair and does not cause suppuration. It therefore does not belong to the Neo-endothrix group because :—

(1) We have never seen spores or mycelium on the outside of the hair shaft.

(2) It differs from the known Neo-endothrix parasites *T. flavum* Bodin 1902 and *T. plicatile* Sabouraud 1909 because in culture it has neither the crater nor the convoluted appearance of these fungi.

It also does not belong to the Endo-ectothrix division because :—

(1) The fungus is found exclusively inside and does not occur on the outside of the hair shaft.

(2) The infected hairs are broken off near the scalp.

(3) It is not associated with inflammatory lesions.

It therefore cannot be confused with *T. griseum* Vasconcellos 1914, which is an Endo-ectothrix of the Gypseum group.

The species of the genus *Tricophyton* belonging to the division Endothrix and arranged chronologically are :—

(1) *T. tonsurans* Malmsten 1845.
(2) *T. sabouraudi* R. Blanchard 1895.
(3) *T. violaceum* Bodin 1902.
(4) *T. sulphureum* C. Fox 1908.
(5) *T. glabrum* Sabouraud 1909.
(6) *T. fumatum* Sabouraud 1909.
(7) *T. effractum* Sabouraud, 1909.
(8) *T. circonvolutum* Sabouraud 1909.
(9) *T. regulare* Sabouraud 1909.
(10) *T. umbilicatum* Sabouraud 1909.
(11) *T. exsiccatum* Uriburu 1909.
(12) *T. polygonum* Uriburu 1909.
(13) *T. sudanense* Joyeux 1912.

These may be recognized as follows :—

A. Condition of mycelium in hair not definitely stated, but probably that of the Crateriform subdivision (see below).
  (1) In cultures very convoluted . . *circonvolutum.*

B. Condition of mycelium in hair definitely stated.
  I. Mycelium in hair resistant to caustic potash, segments characteristically quadrangular in shape, with double contour, 4 to 6 μ in breadth, arranged in fairly straight ladder-like rows . . . . *Crateriform subdivision.*
    (*a*) *Cultures coloured and with craters : Tonsurans group.*
      (2) Yellow in centre, white at periphery . *tonsurans.*
      (3) As "tonsurans" but when old cracked and dry . . . . . *effractum.*
      (4) Orange-red centre, remainder sulphur coloured . . . . . *sulphureum.*
      (5) Golden yellow convoluted centre becoming crateriform later . . . . *sudanense.*
      (6) When old of a yellowish brown colour . *fumatum.*
    (*b*) *Cultures white with Craters : Umbilicatum group.*
      (7) Deeply umbilicated with aureola . *umbilicatum.*
      (8) Slow growth, surface cracked with dry appearance . . . . . *exsiccatum.*
      (9) Growth at first roundish and then polygonal . . . . . *polyganum.*
  II. Mycelium in hair not resistant to caustic potash, segments rounded 4-7 μ in diameter, not arranged as a rule in rows, but if a row is visible it resembles a string of beads and not a ladder . . . . . *Acuminate subdivision.*
    (*a*) *Without acuminate centre : Violaceum group.*
      (10) Primary growth violet . . . . *violaceum.*
      (11) Primary growth white . . . . *glabrum.*
    (*b*) *With acuminate centre : Sabouraudi group.*
      (12) Without duvet when old . . . *sabouraudi.*
      (13) With duvet when old . . . . *pilosum.*

Courmont's parasites cannot be easily classified, except as belonging to the Endothrix division (*vide* section on "Diagnosis").

It is quite obvious that the present fungus does not belong to the A division, because the condition of the mycelium in the hair is known and the cultures are not convoluted.

It is equally obvious that it does not belong to B sub-group II, *i.e.*, to the Acuminate subdivision, because :—

(1) Its mycelium is resistant to caustic potash solution (fig. 6).

(2) Its segments are not rounded (fig. 6).

(3) They do not appear as a string of beads (fig. 6).

It belongs to B sub-group I, *i.e.*, to the Crateriform subdivision, because :—

(1) Its mycelium is resistant to caustic potash (fig. 6).

(2) Its segments are characteristically quadrangular in shape, with double contour, 4 to 5 μ in breadth (fig. 6).

(3) Its segments are arranged in fairly straight ladder-like rows (figs. 4 and 6).

(4) Its rows show dichotomous branching, but it differs from the known members of the Crateriform subdivision in the appearance of its cultures in that :—

(1) A crater is never developed even in the oldest cultures.
(2) The characteristics of a culture are :—
  (*a*) Very quick growth.
  (*b*) White colour until old, when it turns dark.
  (*c*) Central white knob on a white plateau marked by one or two slightly elevated rings and bordered by a slight fringe (figs. 12 to 17).
  (*d*) Absence of "duvet" even in the oldest cultures.

In its cultures it approaches the Acuminate subdivision, but differs from the various members of that subdivision because :—

(1) Its primary growth is not violet but white.

(2) It has not the granular appearance of a *T. glabrum* culture, nor has it the characteristic markings, nor is its surface moist.

(3) It differs from *T. sabouraudi* in not forming conical growths, in the absence of the central plumes, of the yellowish or pinkish rings, of the dark pinkish colour, and of the powdery surface as seen in old cultures. In fact the cultures of *T. currii* have quite different appearances (figs. 12 to 17) as compared with those of *T. sabouraudi*.

(4) It differs from *T. pilosum* in the absence of the dense white duvet in old cultures and in the differences just given above to differentiate it from *T. sabouraudi*.

Nomenclature.—We are therefore forced, by consideration of the above paragraphs, to the conclusion that we are dealing with a hitherto not described species of Trichophyton. We name it after Mr. James

Currie, C.M.G., Director of Education in the Sudan, without whose aid it would have been impossible to have conducted this research, *Trichophyton currii* Chalmers and Marshall 1914.

The etymology of this term is sufficiently obvious.

Definition.—The definition of this new fungus would be—*Trichophyton*: Endothrix with mycelial segments in hairs resistant to caustic potash solution, quadrangular, on the average 4 to 5 μ in breadth, arranged in fairly straight ladder-like rows. Grows aerobically but not anaerobically on most ordinary liquid and solid media. On Sabouraud's proof media it produces a white growth with a knob-like centre on a white plateau with or without two concentric rings and with a slight fringe. In old cultures no duvet appears, but the greyish hyphæ give rise to a dark grey appearance. Habitat: Hairs of the head and skin of scalp of Sudanese in the Anglo-Egyptian Sudan.

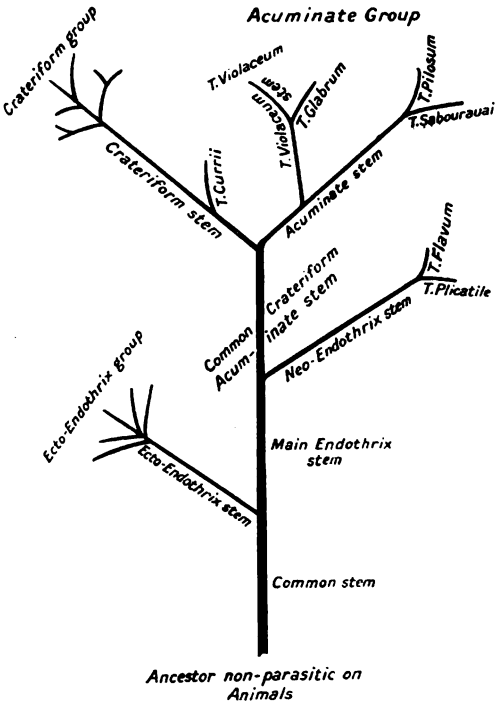


Diagram to show possible relationships of *Trichophyton currii*.

Relationships.—The resemblance of *T. currii* in part to the *Crateriform* and in part to the *Acuminate* subdivisions of the *Endothrix* division of the genus *Trichophyton*, together with some other features which we will deal with in another paper, suggest that it is allied to a common ancestor of the two subdivisions and is on the whole nearly related to the main line of Trichophyton evolution. Our views as to the relationship of the new Trichophyton may be gathered by a study of the attached phylogenetic diagram.

Pathology.—We have never seen the temporary primary ecto-endothrix stage of *T. currii*, but there can be no doubt that this stage exists. So far we have only seen it growing down the hair to near the bulb and up the shaft to a broken end, out of which it may project in the form of chains of quadrangular segments, which must be one method of its spread from man to man. Eventually this growth destroys the hair, the shaft of which early breaks off close to the scalp.

In addition the parasite grows in the superficial cells of the epidermis of the scalp, which it elevates in the form of white scales, but there is never any inflammatory reaction either here or around the hairs.

We have failed to find *T. currii* in animals infected with ringworm in Khartoum.

The disease is not very contagious, the percentage of infected cases in a school not being large. It, however, appears to be well known to the sharper small boys of a school, who call it "gouba."

As far as our observations go it does not affect adults, but a better knowledge of the complaint might alter this opinion.

Morbid Anatomy.—An infected hair is broken off close to the scalp and when pulled out appears to be whiter than natural. The white elevated scales of the patches can be easily seen.

Symptomatology.—The length of the incubation period is unknown, but the early stages of the disease are readily recognized as white scaly patches scattered among the dark hairs of the head (figs. 1 and 2).

When such a patch is examined it will be seen to be more or less devoid of hair shafts, which will be noted to be broken off close (about one millimetre) to the skin of the scalp.

These broken ends may appear as darker spots on the black skin, thus giving rise to an appearance somewhat like the black-dot ringworm of Europe. More usually, however, the end of the hair is covered by a few scales which form a minute whitish mound, but the area being covered by the white scales of the epidermis this black dot appearance is masked.

Usually the patchy appearance is preserved, but at times it may become slightly diffuse in a part of the head. We have never observed it on the skin of the limbs or trunk. Once we observed it on the nape of the neck just below the hairy scalp. There is no sign of inflammation or of enlargement of lymphatic glands to be noted, and there are no subjective symptoms. All our patients have been boys from 10 to 16 years of age. The disease is essentially chronic and slow growing. Apparently it lasts for years if untreated and slowly spreads in the infected school, and apparently may leave small permanent alopecial areas.

Complications.—Once we have observed it to be complicated by a *Cladosporium*. The spores of this fungus were apparently living under the elevated white scales. Castellani, to whom a culture was sent, considers that possibly this *Cladosporium* is a species as yet not described in connection with man.

Diagnosis.—The principal points in the diagnosis are:—

(1) White scattered scaly patches on the scalp.

(2) When the white scales are cleared away the black-dot appearance due to the stumps of the broken hairs is readily seen.

(3) The absence of all signs of inflammation.

(4) Its habitat in the scalp of natives of the Anglo-Egyptian Soudan.

(5) Its microscopical and cultural characters.

The differential diagnosis must be made firstly from the known examples of Tinea capitis tropicalis, and secondly from the known forms of Tinea capitis of the temperate zone.

(1) Tropical ringworms :—It must be differentiated from :—

Name.	Parasite.	Tropical habitat.
(1) Blanchard's ringworm	*T. sabouraudi*	Brazil.
(2) Bodin's ringworm	*T. violaceum*	Asia Minor, North Africa, Brazil (?) and the Argentine.
(3) Castellani's ringworm	*T. violaceum, var. decalvans*	Ceylon.
(4) Courmont's ringworms	*Not named*	Senegal.
(5) Gruby's ringworm	*M. audouini*	Brazil, Senegal, the Western Sudan and Madagascar.
(6) Joyeux's ringworm	*T. sudanense*	Western Sudan.
(7) Sabouraud's ringworm	*T. circonvolutum*	Senegal and Dahomey.
(8) Uriburu's ringworms	*M. fulvum, T. polygonum and T. exsiccatum*	The Argentine.

The only methods of absolute differentiation are the microscopical and cultural examination of the parasite causing the ringworm, but in addition to these some clinical differences may also be noted, but must not be solely relied upon for the differentiation of the variety of Tinea capitis tropicalis observed on a patient's head.

The various points useful in making a differential diagnosis are as follows :—

Blanchard's Ringworm, which was discovered by Sabouraud in 1894, is characterized, as a rule, by small widely disseminated patches or more rarely by a single extensive area. In these patches scales are absent and the stumps of the hairs appear as black dots on the skin of the scalp, hence the name "black dot ringworm."

Other small black points may also be observed caused by the covering of an infected hair by a growth from the stratum corneum of the epidermis. This ringworm is usually found in children from 4 to 15 years of age, and is caused by *T. sabouraudi*.

Blanchard's ringworm therefore clinically resembles the lesions caused by *T. currii*, which may be differentiated by noting :—

(1) The presence of the white scales which are the prominent feature of the lesion of *T. currii*.

(2) The presence of the black-dot appearances, which, however, have to be found by removing the white scales.

(3) The microscopical and cultural characters already given, which are the principal points of differentiation.

A very good illustration of Blanchard's ringworm can be found in fig. 102, page 283, of Sabouraud's celebrated book "Les Teignes."

From *Bodin's Ringworm*, which is due to T. *violaceum*, it can only be recognized by microscopical and cultural characters. Bodin's ringworm is spread nearly all over the world. Sabouraud thinks that it has been disseminated along the Mediterranean basin by the Jews and from this area to the Tropics *e.g.*, perhaps by the Italians to the Argentine.

From *Castellani's Ringworm*, caused by *T. violaceum var. decalvans*, it may be differentiated by :—

(1) Presence in the Soudan and absence in Ceylon.

(2) Absence of enormous numbers of heaped up white scales.

(3) Absence of *T. violaceum var. decalvans* Castellani 1905.

For an illustration of Castellani's Ringworm see fig. 557, p. 1484, of the second edition of "A Manual of Tropical Medicine" by himself and one of us.

Courmont's Ringworms.—We have unfortunately been unable to refer to Courmont's original papers and have drawn our description from Brumpt and from Jeanselme (see References).

> In 1896 Courmont noted small round patches on the head of a Senegalese child. On microscopical examination these patches were observed to be due to a *Trichophyton endothrix* with the so-called spores *en évidence*. The mycelium was resistant and flourished on various media, producing polymorphic and polychromatic growths, according to the temperature. On proof media at 20° C. the growths gave rise to white colonies with rays.

It is obvious that the lesions due to *T. currii* can be distinguished from this ringworm by the absence of the polymorphism, the polychromatism, and of the rays, as well as by the failure to infect animals, which Courmont was easily able to do.

In the same year Courmont observed another form of Tinea capitis tropicalis in Senegal.

> It produced severe disseminated lesions on the head of another Senegalese child. From the lesions he obtained an atypical Trichophyton belonging to the Endothrix division, but characterized by showing none of the so-called spores and only elongated hyphæ. It was found exclusively in the hairs. The cultures had a tendency to cupola formation and the growths on peptone gelatine were pale yellow and moist, while on proof media they were white and dry. This could also be inoculated into animals.

T. currii differs from this most markedly in showing typically the so-called spores in the hairs. The question naturally arises in one's mind as to whether Courmont's last parasite really belonged to the genus *Tricophyton*.

We do not know whether there are any illustrations of these ringworms in existence.

From *Gruby's Classical Ringworm* caused by *M. audouini*, which is moderately common in Africa and South America, it may be differentiated by :—

(1) Absence of large bare patches covered with slate-grey scales and the presence of small white patches with white scales.

(2) Absence of hair stumps broken off 3 to 5 millimetres from the skin, and the presence of the black dots.

(3) Absence of a peripheral erythematous area, or any sign of inflammation.

(4) Slight degree of contagion.

(5) Microscopical and cultural examinations.

Illustrations of this condition are common.

From *Joyeux's Ringworm*, due to *T. sudanense*, it may be diagnosed by :—

(1) Presence in the Anglo-Egyptian Sudan, and possible absence in the Western Sudan.

(2) Absence of grey scales in the alopecial areas and presence of white scales.

(3) Absence of *T. sudanense* Joyeux 1912.

For illustrations of *T. sudanense* see *Archives de Parasitologie*, tome xvi, No. 3, 1er. mars, 1914, Pl. VII.

From *Sabouraud's Ringworm* caused by *T. circonvolutum* it can only be recognized by its cultural characters, which are quite different.

The appearance of the cultures is shown in fig. 128 of Sabouraud's " Les Teignes."

Uriburu's Ringworms.—These are caused by three different parasites, all found in the Argentine.

(*a*) From the infection due to *Microsporum fulvum* Uriburu 1907 that due to *T. currii* can be distinguished by :—

(I) Absence of inflammation.

(II) Microscopical and cultural characters.

(*b*) From the infections due to *T. polygonum* and *T exsiccatum* that caused by *T. currii* can only be distinguished by the microscopical and cultural appearances, as the clinical aspect produced by these parasites is unknown.

II.—*From the Tinea Capitis of Temperate Climates.* For our present purposes we can differentiate the disease due to *T. currii* from the Tinea capitis, due to species of the genus *Microsporum* Gruby and of the divisions Neo-endothrix and Ecto-endothrix of the genus *Trichophyton* Malmsten by the clinical, microscopical and cultural characters already described above. We have, therefore, only the species of the division Endothrix, which have not so far been found in the Tropics, to consider.

These may be classified into :—

A. *Common species.*
   (1) *T. tonsurans* Malmsten 1845.
   (2) *T. sulphureum* Fox 1908.

B. *Rare species : lesions clinically resembling those of T. tonsurans.*
   (1) *T. effractum* Sabouraud 1909.
   (2) *T. fumatum* Sabouraud 1909.
   (3) *T. regulare* Sabouraud 1909.

C. *Rare species : lesions clinically resembling those of T. sabouraudi.*
   (1) *T. glabrum* Sabouraud 1909.
   (2) *T. pilosum* Sabouraud 1909.

D. *Unique rare species.*
   T. umbilicatum Sabouraud 1909.

As we have already described the lesions and differential diagnosis for *T. sabouraudi*, and as we are about to do so for *T. tonsurans*, nothing further need be noted about groups B and C, so that we have only groups A and D to consider.

(*A*) *Tinea tonsurans.*—The lesions caused by *T. currii* differ from those caused by *T. tonsurans* and *T. sulphureum* in that :—

(1) White clean scales are always present.

(2) The hair stumps are black or whitish in colour, not grey or yellow.

(3) The hair stumps are usually very short and are not twisted into irregular shapes.

(4) The cultural variations are very marked.

(*B*) *T. umbilicatum.*—Sabouraud has only seen one case, which he says resembled " *la teigne amiantacée d'Alibert.*" On turning to Alibert's account the following is found :—

> La porrigine amiantacée est ordinairement caractérisée par des écailles ou membranules micacées, luisantes, argentines, qui unissent et séparent les cheveux par mèches, les suivent dans trajet et dans toute leur longueur : elles ressemblent beaucoup à ces pellicules minces, fines et transparentes qui engainent les plumes des jeunes oiseaux, et qu'ils enlèvent avec leur bec, lorsqu'ils sont dans leurs nids, et qu'ils n'ont point encore acquis la faculté de voler, ou plutôt à cette substance désignée sous le nom *d'amiante* par les naturalistes. Cette disposition, par paquets distincts et cylindriques, et qui donne à cette teigne son existence spécifique, est aussi constante que la depression urcéolée qui signale les incrustations du favus, dont nous parlerons plus bas.

This description together with the characters of the parasite is sufficient to separate this form of ringworm from that caused by *T. currii.*

With regard to these rare temperate zone ringworms it is as well to remember that infections which have been found rarely in Europe have subsequently been discovered to be common in the Tropics. Possibly some or all of these rare forms of Tinea capitis may be found to be common in some tropical country.

After the infective stage has passed away, small alopecial patches may be left which require to be diagnosed from similar patches due to favus, which is common in the Tropics, and due to Brocq's pseudopelade. The diagnosis can be effected by noting the absence of small cicatrices.

Prognosis.—As a rule the alopecial patches are small and not noticeable, and therefore the prognosis as regards baldness appears to be good in the cases which we have seen.

Treatment.—We have tried a variety of remedies which all do temporary and not permanent good. Of all remedies the nicotiana-seife or tobacco-soap made by C. Mentzel in Bremen seems to promise best results for a country such as the Anglo-Egyptian Sudan, where a Röntgen apparatus is only available in Khartoum.

Prophylaxis.—Much can be effected by the prompt treatment of cases, as the disease spreads but slowly in a school. We recommend the periodical inspection of all scholars for parasitic diseases, and the prompt treatment of such cases as are found.

Acknowledgments.—We have much pleasure in acknowledging the kind interest which Dr. Castellani, of Ceylon, and Captain Archibald, R.A.M.C., of these laboratories, have taken in this work.

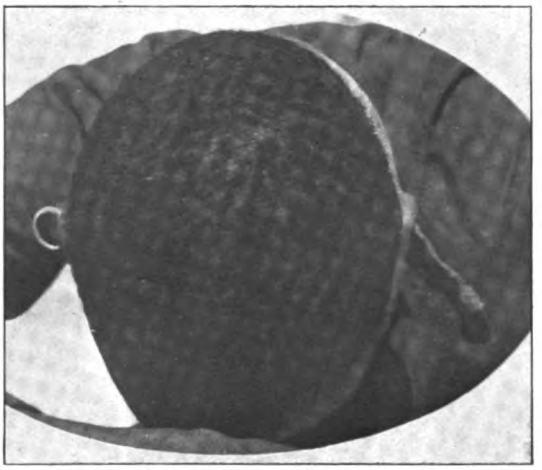
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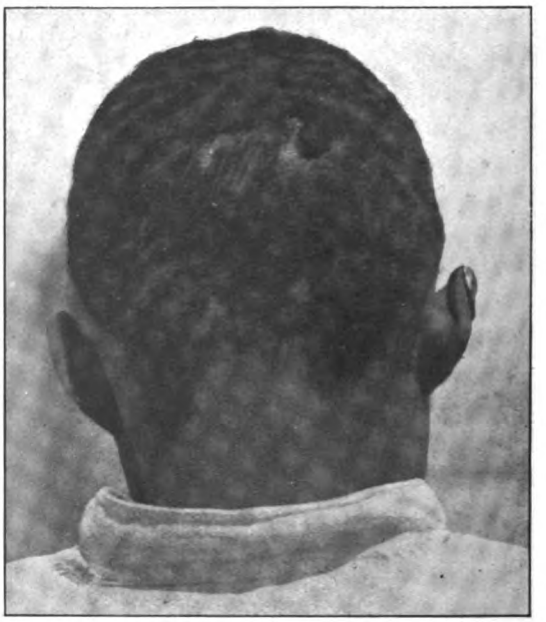
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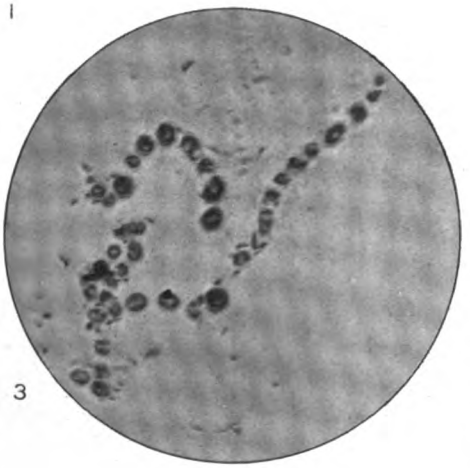
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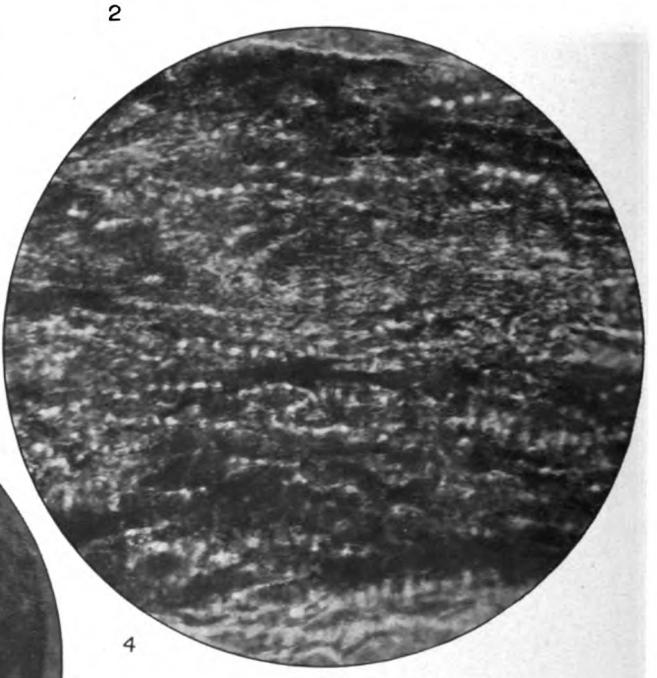
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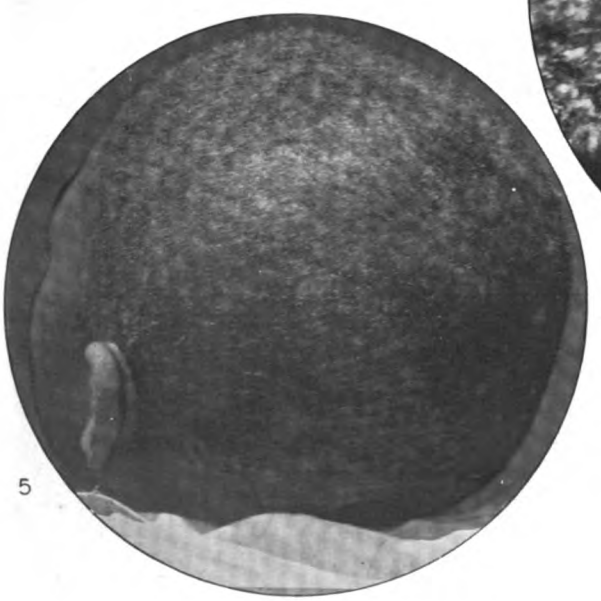
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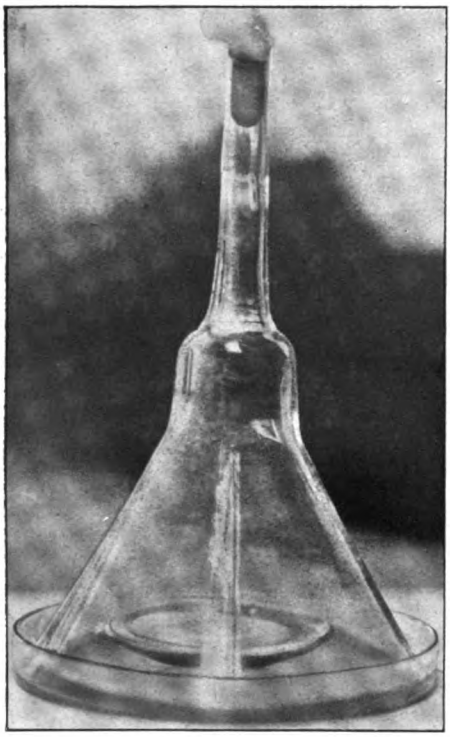
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To illustrate article, "Tinea Capitis Tropicalis in the Anglo-Egyptian Sudan," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and ALEXANDER MARSHALL.

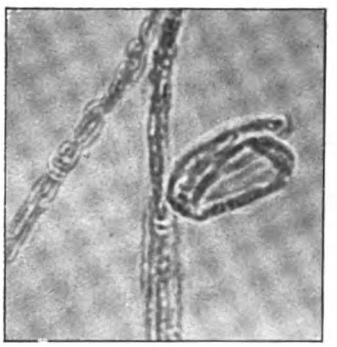
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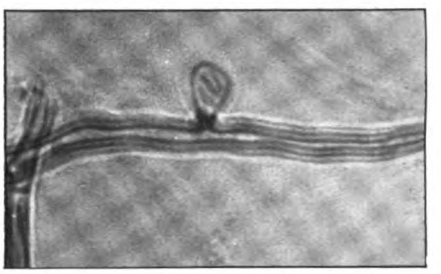
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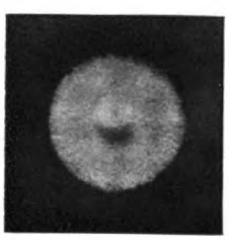
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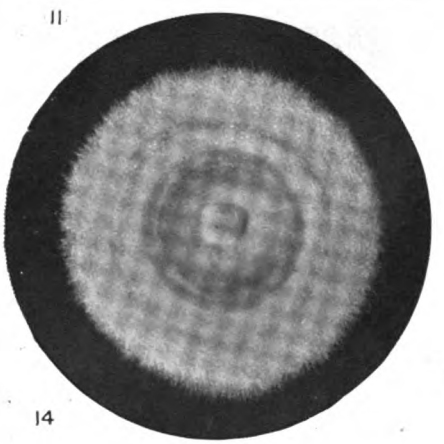
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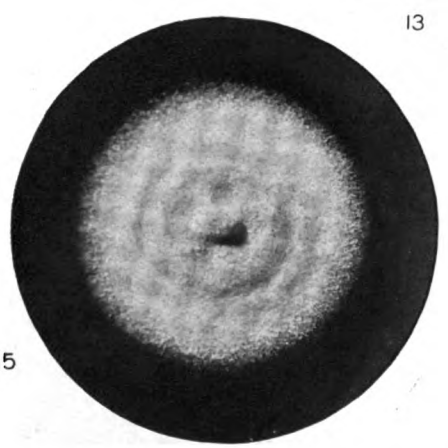
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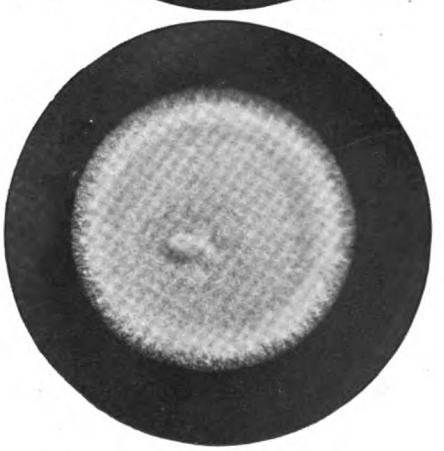
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To illustrate article, "Tinea Capitis Tropicalis in the Anglo-Egyptian Sudan," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and ALEXANDER MARSHALL.



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ILLUSTRATIONS.

Most of these illustrations may, with advantage, be examined by means of a lens.

PLATE I.

FIG. 1.—Showing white infected areas on the crown of the head in a case of early infection. *Photograph.*

FIG. 2.—Occipital region of the same case as fig. 1, showing the white areas of infection. *Photograph.*

FIG. 3.—Scrapings from a white area after treatment with 40 per cent. caustic potash and staining by Adamson's method, showing the rows of hyphal segments which are shrunken owing to the staining, &c. × 1,520. *Photomicrograph.*

FIG. 4.—A hair from an infected patch after treatment with caustic potash to show the longitudinal rows of hyphal segments. Fresh preparation. × 1,060. *Photomicrograph.*

FIG. 5.—A later stage of infection showing a more diffuse attack of the vertex. *Photograph.*

FIG. 6.—Similar specimen to Fig. 4, showing a single row of hyphal segments obtained by rupturing a hair laterally by means of needles. Fresh preparation. × 1,370. *Photomicrograph.*

PLATE II.

FIG. 7.—Simple apparatus for growing fungi for photographic purposes. It consists of: Half a Petri dish, a watch glass and nutrient medium, and a filter funnel. *Photograph.*

FIG. 8.—*Trichophyton currii:* Growth on carrot at 34° C. for four days. *Photograph.*

FIG. 9.—*Trichophyton currii:* Spiral body, early stage, growth obtained by De Beurmann and Gougerot's method of "*Lames séchés*" and then stained *in situ* by carbol-fuchsin. × 2,470. *Photomicrograph.*

FIG. 10.—*Trichophyton currii:* Chlamydospore, early stage. × 3,250. *Photomicrograph.*

FIG. 11.—*Trichophyton currii:* Hypha, short conidiophore and conidium. × 2,620. *Photomicrograph.*

FIG. 12.—*Trichophyton currii:* Growth on Sabouraud's maltose agar for two days at 34° C. *Photograph.*

FIG. 13.—The same as fig. 12, but four days' growth at 34° C. *Photograph.*

FIG. 14.—The same as fig. 12, but seven days' growth at 34° C. *Photograph.*

FIG. 15.—*Trichophyton currii:* Growth on maltose agar for five days, but from a different case than figs. 12-14. *Photograph.*

FIG. 16.—*Trichophyton currii:* Growth on Sabouraud's maltose gelatine at 20° C. for five days. *Photograph.*

FIG. 17.—*Trichophyton currii:* Growth on Sabouraud's glucose agar for five days at 34° C. *Photograph.*

PHARMACOLOGY OF FORMALDEHYDE.

Experiments with dogs have shown that formaldehyde is readily absorbed from the alimentary tract and lungs, and may also be excreted by these organs. It is quickly oxidized in the body into formic acid and carbon dioxide. Large quantities cause inflammatory symptoms, though smaller amounts may be absorbed without such effects. Formaldehyde acts directly on the heart, producing a lowering of the blood pressure. It quickens the respiration, and stimulates the intestines. The author states that the use of formaldehyde in medicine must still be restricted to external application. As antidotes in cases of poisoning, morphine and ammonia are recommended.—H. McGuigan (*Journ. Amer. Med. Assoc.*, 1914, 62, 984).

ESTIMATE OF CASUALTIES IN EUROPEAN WAR.

FROM the figures supplied by Dr. Laurent of Brussels it is possible to form an estimate of the casualties likely to occur in the present war.

In the late wars between Bulgaria and Turkey, Bulgaria employed an army of 500,000 men. In the two wars, 46,000 were killed, one in twelve of the whole army, and 115,000 wounded, a total casualty of 161,000, about a third of the army. During one month, July, 1913, there were 150,000 casualties, killed and wounded, on the two sides; 80,000 of these occurred during the six days, June 30 to July 5.

From the author's estimate, made before the present war, that in a European war ten times as many would be engaged and a proportionate increase in casualties, he estimates not less than 1,500,000 dead and wounded in the course of the first month.

TRIPLE ACID PRURITUS OINTMENT.

Carbolic acid	1 grm. (5 gr.).
Salicylic acid	2 grm. (10 gr.).
Tartaric acid	3 grm. (15 gr.).
Glycerine of starch ...	80 grm. (1 oz.).

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 1, 1914.

DISCUSSIONS AT THE TROPICAL SECTION OF THE BRITISH MEDICAL ASSOCIATION.

THE Section of Tropical Diseases at the recent meeting of the British Medical Association at Aberdeen, although no startling discoveries were announced, was interesting in several ways. Of the three main subjects put down for discussion, namely, "Kala-azar," "The Education and Position of the Sanitarian in the Tropics," and "Treatment of Intestinal Lesions," the first-named called forth most discussion. Fleet-Surgeon P. W. Bassett-Smith, C.B., drew attention for the most part to *Leishmania donovani*. The geographical distribution of the infection is now better known, due to more accurate diagnosis and not apparently to the spread of the disease in recent times. It is a fact that from a morphological point of view there appears to be no means of differentiating the parasite as it occurs in India, China, or in the Mediterranean; and there seems little doubt that the viruses of the Indian and the Mediterranean forms are identical; hence there is no advantage in retaining more than one name for the parasite causing the generalized infection, either in the Far East, India, Africa, the Mediterranean Basin, or America. The treatment of the ailment has not, however, advanced with our knowledge of the disease, and neither atoxyl nor salvarsan can be considered either efficient or hopeful means of cure. The spread of the disease by the bed-bug (*Cimex rotundatus*), by house infection, by dogs, by fleas, have all been suggested, but none have been conclusively proved, as the agents of transmission; and Professor Gabbi, from a study of Basile statements, is inclined to think that it will be necessary to discover an insect intermediary other than the dog-flea as the channel of transmission to man.

Dr. D. E. Anderson believes that *uta*, a Peruvian ailment, is none other than nasopharyngeal leishmaniasis; and Drs. Bahr, Ferguson and Williamson drew attention to the absence of leishmaniasis infections in Ceylon, Egypt, and Cyprus respectively.

Colonel King, C.I.E., in his paper on "The Education and Position of the Sanitarian in the Tropics" insisted upon the necessity of specializing in sanitation at an early period of the career of medical men, and considers that even in their student days men should decide whether they are to follow the clinical or the sanitary branches of their profession.

That such a decision may have to be arrived at in future years, owing to the growing bulk of medical and sanitary knowledge that has to be acquired, may be considered probable, but it was held by the majority of those present that the time had hardly come for that yet. To be a good sanitarian requires an intimate knowledge of disease, and that can only be acquired at the bedside; to sidetrack clinical work during the last year of medical studies would be to cut off clinical education during the only year of study that afforded the student any grasp of disease at all.

In the medical department of the Army there is the same question: namely, clinical *versus* sanitary, and yet another "*versus*," viz., executive. The clinical side is apt to be forgotten, partly because in sanitary work one wholly avoids the anxieties and constant worries attendant upon the practice of medicine, and partly, in home hospitals at least, from the sparsity of material for study. Again, the clinical department in Army work ceases as a rule altogether after some fifteen years, when the officer is promoted and has to deal with executive work only.

Specialization is a necessity in every branch of science, and none more so than in medicine; the question is when should it commence. Colonel King says in student life, and his claim, although at present regarded as "too advanced," may, and in all probability will, be listened to and acted upon. The subject for discussion on the last day of the meeting was "The Surgical Aspects of Lesions of the Large Intestine, more especially those of the Post-dysenteric State." Mr. Cantlie, who opened the subject, fixes upon the sigmoid flexure as the seat of post-dysenteric lesions, and chiefly the lower two

inches of the sigmoid, that is, just as it joins the rectum.

The proof that this is the area of the bowel affected seems to be incontestable, for not only does Mr. Cantlie show that examination with the sigmoidoscope by way of the anus supports this, but that, after opening the sigmoid flexure above the left groin, the sigmoidoscope, introduced through the opening and passed downwards to the junction of the sigmoid flexure and rectum, gives further evidence of the truth of this statement. Mr. Cantlie contends that the sigmoid flexure is an entity, a portion of the bowel with specialized functions, and therefore to be considered by itself and not as a mere portion of the large intestine. He has dignified the entrance and exit to the sigmoid as apertures with marked characteristics and styled them the colo-sigmoid and the sigmo-rectal respectively. The latter is the more important clinically.

The treatment of post-dysenteric lesions at the sigmo-rectal pylorus and lower two inches of the sigmoid Mr. Cantlie states clearly and definitely to be: Rest in bed, washing out the bowel with sea-water (natural or artificial) daily for a few days, touching the ulcerated surface of the sigmo-rectal pylorus with pure carbolic acid occasionally; injections of colloid silver (Crookes), a teaspoonful (or more) to 6 oz. water daily. Under this *régime* the lesions speedily disappear, even in bad cases, within a week. Diet is of little consequence in the treatment. In addition, Mr. Cantlie contends that the mere fact of the passing of the sigmoidoscope through the seat of the lesion is helpful in the cure, owing to the fact that there is always narrowing of the bowel at the seat of the trouble.

Abstracts.

THE INFLUENCE OF CLIMATE, DISEASE, AND SURROUNDINGS ON THE WHITE RACE LIVING IN THE TROPICS.*

By Anton Breinl,

Director of the Australian Institute of Tropical Medicine, Townsville.

THE facility of transport and communication have brought the Tropics nearer to the temperate zone. An ever-increasing demand for tropical products for our daily life has arisen, and many of them have entered into the constant consumption of every family in the United Kingdom. Moreover, the Tropics supply raw material for manufacture upon a constant supply of which more than twenty millions of wage-earning inhabitants of Great Britain depend for means of existence, and, above everything, the "transplantation of the redundant masses from overcrowded areas to areas where their services are urgently required, has become recognized as one of the highest functions of civilization."

It is perhaps necessary, in the first instance, to define what we mean by "Tropics." According to the geographical definition, the Equatorial zone includes the country between latitude 23 deg. 27 min. north and 23 deg. 27 min. south of the Equator. As might be expected, however, the geographical definition is not coincident with the isothermal charts, and Supan limited the tropical zone to the region situated between the two mean annual isotherms of 68 deg., a temperature which coincides with the northern and southern limits where palms flourish—the truest expression of the tropical clime.

Within these limits, however, the meteorological conditions are so diverse that one is hardly justified in speaking of a uniform tropical climate, of which, according to our conception, the main characteristics should be the highest temperature and the highest humidity.

These peculiarities of the tropical climate are most pronounced in regions situated near the coast which are low-lying, and which, on account of their natural advantages, are the centres of settlement by Europeans. There the mean temperature is very even, and the uniform distribution of temperature involves uniform pressure distribution.

The great humidity of the air is an outcome of the enormous extent of the sea, and of the large tracts covered with dense luxuriant vegetation.

The influence of the tropical climate on Europeans is an extremely complex subject. Amongst the conditions to which the deleterious and debilitating effect of the climate is ascribed may be enumerated the excess of sunlight, the humidity of the atmosphere, and the equable temperature. It is, however, extremely difficult to estimate the influence of these factors upon the white man living in the Tropics, as "there always enters an element of uncertainty owing to the absence of absolute means of measurement and the variability of other hygienic surroundings."

Among other factors, one may mention the untoward effect of unsuitable clothing, housing, improper food, alcoholic excess, and last, but not least, of the infections with parasites belonging to the animal or vegetable kingdom which occur in great abundance, and are, in many instances, confined in distribution to tropical regions.

Of the three climatic factors the sunlight can be the most exactly studied, and Paul Freer, of the Manila Bureau of Science, was the first to make comparative measurements of those rays of the solar spectrum—the violet and the ultra-violet rays—to which most of the effect of tropical sunlight is usually attributed.

For this purpose the photocatalytic decomposition of oxalic acid in the presence of uranyl acetate has been employed. Oxalic acid, when exposed to the sunlight in the presence of uranyl acetate, is decomposed into carbon monoxide, carbon dioxide, and water, and it has been shown that this reaction is brought about almost entirely by the rays in the violet and ultra-violet portions of the spectrum, and that between certain limits the influence of temperature on the rate of reaction may be neglected. A comparative measurement of the intensity of sunlight in those particular rays may therefore be made by determining the extent of the decomposition in

* One of the Stewart Lectures of the University of Melbourne, 1913.

a standard mixture of these compounds, when exposed to the sunlight under standard conditions. The Manila authorities have devised such standard conditions as to hours of exposure, concentration of solutions, size of vessel, &c., whereby observations may be made daily over reasonably long periods, and an average figure obtained for comparison with similar observations made in different parts of the globe. Such observations have been made at Manila and Baguio, in the Philippines, 14 deg. 13 min. north, Kuala Lumpur (Malay) 3 deg. 10 min. north, Honolulu (Hawaii) 21 deg. 18 min. north, Khartoum (Sudan) 15 deg. 31 min. north, and other places.

Daily observations by this method have been made in Townsville since February, 1913, and the figures show that Townsville has an exceedingly high insolation as far as these rays are concerned.

At Manila the maximum was 17·8 and the minimum 1·15 during fifteen months' observation; at Honolulu the maximum day observed out of ten months was 20·77, the minimum 3·48; Kuala Lumpur (seven months' observation) had a maximum of 18·1, and a minimum of 9·0; Khartoum (three months) gave a maximum figure of 20·8 and a minimum of 14·7. The average was 17·16, or 5·15 higher than Manila. At Townsville during the seven months a value of 21 was reached on no less than eight days, much higher than any recorded at the above places. Curiously enough the figures obtained in Brisbane, where observations have also been made during this year, were higher still, the maximum recorded being 23. Thus, so far as these particular rays are concerned, tropical Australia appears to take a high place.

The animal body is capable, not only of regulating its heat production from the combustion of foodstuffs, but also its loss of heat from water evaporation.

Normally the thermal effects of the surroundings are compensated either by a suitable transference of heat to the surroundings, or by conservation or production of heat within the body, so that, practically speaking, the body temperature remains the same within narrow limits.

The higher the temperature of the surroundings, the less heat will be lost by radiation, and if this temperature exceeds that of the body, no heat can be lost in this way and the body temperature would rise, were it not for the loss of heat occasioned by evaporation of water from the lungs and from the surface of the body.

High temperatures alone, therefore, do not change the body temperature so long as the latter can be regulated by the loss of sufficient heat through water evaporation.

The numerous observations as to the body temperature of Europeans in the Tropics vary slightly in their results. The consensus of opinion, however, seems to point to the fact that a slight rise of body temperature may be noticeable during the passage from a temperate to a tropical clime, varying between 0·36° F. and 1·5° F., but experienced observers, like Plehn, in the Kamerun, and Eijkman, in Java, have proved that there is no increase in the body temperature of acclimatized Europeans whilst resting or taking moderate exercise, the readings in the axilla varying between 97·9° F. and 99·1° F.

The coloured population in the Tropics shows, according to numerous observations, practically the same body temperature as acclimatized Europeans. It is a well-known fact that even in a temperate zone exercise causes a rise in body temperature, and, as might be expected, this rise is more exaggerated in the Tropics, and most marked on a steamy hot day.

A comparative study of the skin temperature of a white and coloured population in the Tropics has been made by Aron, in Manila, by means of a specially constructed thermocouple, which made accurate readings possible to within one-tenth of a degree, and his results are extremely significant.

It was shown that the naked skin if exposed to the rays of the sun is warmed very quickly to about 97° F. If one side be kept in the shade and the other exposed to the sun, the differences in temperature on the two sides may amount to as much as 5·4° F. Above 97° F., with a maximum air temperature of 98·6° F., the temperature of the skin no longer increases. On the contrary, if exposure be continued the temperature falls more or less coincident with the outbreak of perspiration—the greater the outbreak of perspiration the greater the fall in the temperature of the skin.

In comparing the skin of the white man with that of the brown man, Aron finds that on exposure to the sun the skin of the brown man absorbs more heat than does the white skin in the same length of time.

As brown skin absorbs a greater quantity of rays than white, the point where sweat secretions begin is reached earlier than in a white skin, and as soon as this point is reached the skin is cooled by water evaporation. The regulating apparatus of the brown man is thus more sensitive, and works more promptly and successfully than than of the white under similar conditions.

Aron further points out that at a time when the white man is perspiring profusely over his entire body, and the sweat is dropping from his face and forehead, the brown man shows only a fine velvet-like layer of very small drops on his skin.

It is thus not the sweat which we see, but the sweat which we do not see, which exerts the cooling influence. In other words, the water evaporated, not the water secreted, is of value.

In case a European is transplanted to a hot climate, the amount of energy required for the upkeep of the functions of the body is not increased; if anything, it might be expected to be decreased, and as the body temperature of an acclimatized European is normal, *a priori*, the metabolism should be exactly the same as in a temperate climate.

Amongst the investigations which have been conducted in this direction, mention may be made of those of Rubner on human beings, and those of C. J. Martin on animals. In both cases the experiments were carried out under artificial conditions, the subject being placed in a specially constructed respiration chamber, maintained at varying temperatures and stages of humidity, and balance-sheets were drawn up between intake of food, water, and oxygen, and output of carbon dioxide and water.

The general results of Rubner's experiments showed that with scantily clad human beings there was, with rising temperature, a decrease to a minimum of the excretion of carbon dioxide, averaging about 75 per cent. per degree, whilst the excretion of water was considerably increased.

At lower temperatures water was secreted almost entirely by the lungs, whilst at higher temperatures the skin began to perspire, the evaporation increasing with rising temperature.

A similar reduction in the output of carbon dioxide under the same conditions was also observed in Martin's experiments on animals.

Eijkman carried out similar experiments in Java under natural conditions on Europeans and natives. These experiments, although few in number, seem to show that the metabolism of an acclimatized European living in the Tropics does not show any appreciable difference from the European standard, that nearly the same number of calories per kilogram of body weight is required, viz., 33·1 in comparison with 34·9, a difference which is well within individual variations, and that the chemical metabolism of the organism is not being called upon for the regulation of body heat to a lesser extent than in a temperate climate. The experiments related are, however, by no means conclusive, and a good deal of work is still required to bring order into the chaos of facts which have been collected.

Of the organs of the body the blood is suspected to suffer most under the influence of a tropical climate, and the term "tropical anæmia" can be found in nearly all text-books of older date, as an idiopathic anæmia occurring in the Tropics. With the advance of knowledge of parasitology cases of this complaint have become rarer and rarer.

Idiopathic tropical anæmia is most probably only skin deep; in other words, the anæmic looks of many of the white people living in the Tropics are caused by the coarseness and dryness of the epidermis.

Eijkman's observations on the number of blood corpuscles, the quantity of red-colouring matter, the hæmoglobin, and on the specific gravity of blood and plasma of acclimatized Europeans in the East Indies, pointed to the fact that the tropical climate, as such, does not lead to any appreciable change in the quality of the blood.

Similar observations have been made by the American workers in the Philippines. The blood examinations of healthy young American soldiers (1,418 red cell counts and 1,433 hæmoglobin estimations on 702 soldiers) after twenty months of Philippine service gave the same results as those recognized for healthy young men in the temperate zone.

The observations of the Philippine observers are extremely interesting, but are lacking in one respect, viz., the subjects chosen for observation had only been living in the Philippines for a comparatively short time, and were especially chosen healthy individuals, who had to undergo a strict medical examination before being sent on service abroad. For some time observations on the same lines have been carried out in Townsville. The blood of school children has been carefully examined. This examination has proved that there is no appreciable difference between the blood of children of the second and third generation as far as the number of formed elements of the blood is concerned.

We (Dr. Priestley and myself) have, however, been able to make very interesting observations. Some time ago Arneth made a careful and systematic study of a certain class of white blood corpuscles, the polymorphonuclear neutrophile leucocytes. The leucocytes, when stained by different dyes, possess a large irregularly shaped nucleus, sometimes resembling a horseshoe, sometimes split up into a number of nuclei or nuclear fragments, so that in numbers of them three, four, or more apparently distinct nuclei can be differentiated.

Arneth observed a definite relationship between the number of cells possessing one, two or more nuclei, his relative figures being based, as a rule, on 200 consecutive cells found in a stained specimen. By adding up the number of cells containing one and two nuclei, and comparing it with the number of those showing three and more nuclei, an index was obtained, usually called after the author "Arneth index."

He named the conditions when the first and second class, containing one or two nuclei, were increased above the normal number, and the third and fourth correspondingly decreased a shift to the left, whilst the reverse alteration is a shift to the right. Arneth considered a shift to the left as a sign of lowered resistance to disease.

Whilst examining the blood of Filipinos, Chamberlain and Vedder found a very marked shift to the left in Filipinos in comparison with that of normal Europeans.

Our own observations on the blood of healthy school children have shown that there is a decided shift to the left of the Arneth index, and the figures obtained are nearly identical with the figures obtained in Filipinos.

This observation is exceedingly interesting, as it is a change which may be due to climate alone. Careful work will, I hope, throw further light on this change, whether it is the expression of a lowered body resistance to certain maladies or without any marked significance.

Our work as regards the blood-pressure of North Queensland children shows that it does not differ to any appreciable extent from the blood-pressure of normal European children, showing a mean of about 116 mm. mercury.

As might be expected, the climatic conditions do effect certain changes in the inner workings of the organism. The excessive perspiration relieves the kidneys of a part of their work. In a hot climate the amount of urine decreases correspondingly to the amount of fluid which is being excreted by the skin. Daily quantities of urine of only 500 to 700 c.c. are common, against 1,500 in a temperate zone. The urine, however, is far more concentrated, and the smaller quantity contains the same amount of waste products as the larger volume elsewhere. The high concentration of the urine might explain the higher frequency of kidney diseases observed in the Tropics.

It is of common knowledge that, as a rule, the girls

attain puberty earlier in life in tropical climates. A table compiled by Raciborski shows that there is a distinct connection between the mean yearly temperature and the age of puberty. In the northern and central parts of Europe the average age is 15-16 years; in southern Asia 12 years and ten months is given as the average age. Glogner's observations in the East Indies show that out of twenty-five girls of European descent, and born in India, in eighteen cases puberty came at an earlier age than in Europe; as a matter of fact, at the same age as in half-caste girls.

The foregoing observations show that our knowledge of the influence of the climate in the stricter sense is very limited indeed. Disconnected facts have been gathered at different times, and under different and often very adverse conditions, and, above everything, the work has up to now not been sufficiently extended to allow of the formation of definite conclusions, especially in the direction of investigation of the most minute physiological functions of the organisms under tropical conditions.

All changes would be expected to become noticeable very gradually, and such changes, if taking place, would be hardly observable in the first generations, would be more marked in the second and become apparent to the naked eye in the third generation, or perhaps even later.

As proof I may quote our own observations on the "Arneth index." A few observations on Europeans acclimatizing in the Tropics showed a slight shift to the left which, however, was still within the individual variation. In the third generation, on the other hand, a distinct and unmistakable shift to the left was present.

I am convinced that when our work has progressed far enough to exclude gross changes, that numerous and careful observations on the physiology of the human organism under tropical conditions will show that certain minute changes do take place, and will become more marked in succeeding generations.

The Influence of Disease.

This influence of parasitism has been more thoroughly studied, and the advances made within the last fifteen years in tropical parasitology and bacteriology have revealed to us host upon host of new and deadly parasites, which are solely confined in their distribution to tropical regions.

Anywhere in the Tropics where white settlers went malaria formed a formidable barrier. Soon after their arrival they contracted the fever, and whether in Africa or South America or New Guinea white tombstones marked the tracks of the first pioneers with the inscription that ———— died of fever. Numbers of them took flight, and returned to Europe, often invalided for life, and hardly able to obtain colours glowing enough to describe the "New country as a devil's paradise."

And the children! It is a pitiful sight to see in an endemic malarial centre the small children suffering from chronic malaria. The complexion is ashy grey, the face is œdematous. They are pot-bellied, and one can often see without palpating the abdomen the outline of the enormously enlarged spleen.

On considering in a general way the mental and bodily progress in the course of the whole human life, it becomes apparent that a child in its early infancy is capable of assimilating mentally many times the amount any adult could possibly digest in the same space of time. If the mental capabilities are curtailed during infancy on account of chronic malaria or any other chronic debilitating disease, much valuable time is lost for the further development, and backwardness, due to lost opportunities, will become apparent and more and more pronounced as the child grows older.

Of other diseases yellow fever has been an important factor in checking the stream of emigrants to countries where this particular disease is prevalent.

I remember how one used to look with pitying eyes on the new-comers in North Brazil, knowing for certain that nearly 25 per cent. to 40 per cent. of all would, within a short time, succumb to this disease.

Parasitism, on the whole, is much more common in the Tropics than in a temperate climate, since the conditions for the development and spread of animal parasites are more favourable on account of the humid and hot temperature. The infections with helminth are extremely common throughout the Tropics. The most dreaded of all such infections is agchylostomiasis, which is so common and widely spread. The adverse influence which this infection has upon children, especially in early years, can hardly be overestimated. Many of the infected children are pale, listless, take no interest in their surroundings, are very irritable, their night's rest is disturbed, their appetite is impaired, and the little sufferers show a perverse craving for all sorts of rubbish, earth, sand, wood, paper; in fact, there is hardly anything which can be swallowed which is not eaten at one time or another by the children suffering from this disease.

In case the patients are not treated at an early stage of the disease, and the infection becomes chronic, the children are marked for life, and present the typical aspect of a degenerate.

When examining school children one is always able to pick out the children suffering from agchylostomiasis, who are at the same time, as far as their progress at school is concerned, dull and obstreperous.

The much-quoted examples of modern sanitation in the Tropics, such as Ismailia, parts of India, and the West Coast of Africa, have given conclusive evidence that a great deal of the deteriorating influence which has been attributed to climate, as such, is in fact only due to parasites, and that with the awakening of our knowledge of parasites, their life-histories and intermediary hosts, the curse which has been lying on many parts of the Tropics has been removed.

The Influence of Surroundings.

Personal hygiene, as clothing, housing and food, are all factors which have an important bearing upon the personal welfare of white men living in the Tropics. Even the smallest and apparently negligible detail may give rise to serious consequences. One

example may illustrate this statement. Frequently children are brought to the hospital, the parents complaining of the child being unwell, peevish, and listless. Other children are brought in showing clinical symptoms of fully developed lead poisoning, drop wrist, drop foot, blue line in the gum, &c. The clinical examination of the urine and fæces showed the presence of lead in the excrementa, sometimes in considerable quantity. The most obvious explanation, after excluding the water supply, is that given by previous observers, namely, that the lead paint of the veranda rail became softened by the heat or dried up in the sun, and the little mites ingested enough of the paint by putting their fingers into their mouth to become seriously ill, and often crippled for lifetime.

Experience of life during my residence in different parts of the Tropics may perhaps justify the expression of my personal opinion. As a rule, when compared with the overcrowded parts of Europe, the conditions of life are much easier in the Tropics. The competition is less on account of the sparsity of the white population, salaries are larger, and in the parts with a large native population numerous servants can be obtained for very small wages, so that the proud white man is not forced to do any menial work, and his position is that of a supervisor.

The hot sun, the abuse of alcohol, the proud position into which the average man has been placed tend to bring forth a considerable change in his character. The amount of energy required to produce the necessities of life, which are on the whole smaller than in a temperate climate, is lessened, and the healthy, vigorous young man who emigrated to the Tropics becomes afraid of work, unable to concentrate, and, generally speaking, a weakling.

The mental picture I have drawn, however, is fortunately not the rule, but is only an extreme example of the influence of the changed surroundings upon a weakling whose energy in a temperate climate was only kept up by the fight for his daily bread. The European with energy and ambitions will, as a rule, be only slightly affected by the changed conditions of life and the alteration of his social condition. Even he will lose a certain amount of his energy; he will feel tempted to succumb to the fascination of the *dolce far niente*. A call on his energy will, however, always be answered, and he will be able to do nearly the same amount of work bodily and mentally as anywhere in Europe.

The white woman who emigrates to the Tropics will be much more affected by the change of surroundings than the man. During the hot hours of the day she is compelled to stay in the house, and as most of the housework is done by coloured servants for very small wages, she will have hardly anything to occupy her mind. The social conditions are altered in comparison with those in which she has been reared. The social gaiety of life to which she has been accustomed is non-existent, and very soon she will begin to fret, and the lack of outdoor exercise will accomplish the rest. The woman will soon be discontented and homesick, and her only subject of conversation will be the behaviour or misbehaviour of her native servants. This case again depicts an extreme. The common-sense, healthy young woman, with a good deal of *esprit de vie*, and with varied interests, will never drift so far, but even she will suffer now and again from discontent and homesickness.

It is said, and nearly everyone agrees on this one point, that it is essential to send the children as soon as a certain age is reached (usually between 5 and 8 years) away for their education. One has to consider that the children are left to a great extent in charge of native servants; they soon begin to realize their apparent superiority over the coloured servants; they become peevish and completely spoiled. Moreover, the imitative sense is strongly developed; the children begin to imitate the ways and habits of the coloured races amongst whom they are living.

If, now, we consider the application of the foregoing to conditions prevalent in tropical Australia, we find that tropical Australia enjoys, in many respects, quite a unique position amongst other tropical lands. Although situated within the Tropics, it has diversity of climes within easy reach, ranging from the humid, hot, low-lying coastal districts to the bracing atmosphere of a high table-land. There is practically no native population, the few surviving aboriginals are of so little importance that their influence is not felt.

The absence of a native population makes the dealing with disease an easy matter. Modern experience gained throughout the world has proved that well and discreetly administered law, in a community educated in matters of hygiene and in appreciation of cleanliness, can accomplish even the most difficult task.

The absence of a native population, furthermore, does away with many of the social conditions which prevent a white community in other parts of the Tropics from gaining a firm foothold.

Most of the factors constituting "surroundings" can be adjusted and improved in accordance with the knowledge gained by experience, careful research, painstaking observations, and scientific collecting of statistics.

In Northern Australia we have, therefore, only one factor which might prevent the successful colonization by a white working population, and that is "climate."

Unfortunately, as we have previously seen, our knowledge of purely climatic influence is still in its infancy, and the facts and observations collected in other tropical countries cannot be applied, as is so often done, to tropical Australia without careful discrimination.

Years of detailed and minute research carried on in the populated coastal districts of tropical Australia, where a second and a third generation is being reared at present, will clear up the question of the climatic influence on the white man in the Tropics, and the result of this work will indicate whether the great experiment of populating tropical Australia with a white working community can be accomplished.

It would be precarious to express a definite opinion that a colonization of tropical Australia by a white population is possible, since statements either way

cannot at present be substantiated by facts, but are only the expression of a personal opinion.

It cannot be denied, however, that tropical Australia offers far more favourable conditions than any other tropical country for permanent white settlement.

We are faced here with one of the most far-reaching experiments of modern times, and experiment which certainly justifies the application of unlimited effort, as its result is the possession, not only of the north, but of the whole of the united Australia by a white community.

Correspondence.

INTRAMUSCULAR INJECTIONS OF QUININE.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—In a recent number of your Journal you had an article inveighing against the intramuscular injection of quinine, in which you ended up by saying that you hope that a method of administering the drug which never had anything to recommend it will be given up.

You quote authority, including that of Ross, but it would not be difficult to counter-quote other authorities with quite as wide a clinical experience; and though authority is naturally listened to, when it runs contrary to the clinical experience of many it is desirable that the whole argument should be thoroughly stated.

In this country intramuscular injections are given very frequently, and many of us would like to know the whole of the arguments that can be advanced against them.

We know Semple's work on tetanus, but many of us think that the danger is so remote as not to be worth considering; and if lives can be saved by intramuscular injection that cannot be saved otherwise I do not think that the infinitesimal risk will prevent men from giving quinine in this way. Tetanus may be caused after the intramuscular injection either by bacilli already in the system or by bacilli injected with the quinine; but it is of no use to mention that eleven cases occurred during the Madagascar campaign and that someone has collected another ten cases; we want to know the percentage of cases of tetanus to intramuscular injections. The tetanus bacillus has been found in catgut ligatures: this has not stopped the use of catgut, but it has produced more care in its sterilization.

It certainly would be very sad to have a case of tetanus following the use of an intramuscular injection; but, unless it can be shown that the risk is disproportionate to the gain, I do not think that the many who have used the method with so much benefit will be likely to give it up.

You mention the unsuitability of the salts of quinine for hypodermic use, which chemically is perfectly true; but I, and many others with whom I have discussed this matter, have seen temperatures come down after intramuscular injections which had not been touched by quinine by the mouth, and this not merely in a few cases but very many times. It is not of much use to talk of chemical incompatibility and slowness of absorption if the clinical results are good, as they have been known to be in perhaps thousands of cases.

Then the slow absorption is given as a reason against the method; but it is possible that this is really in its favour, as the absorption is practically continuous, and after the injection there is probably for a long time some quinine in the blood ready to hit off any sporulating organisms: whereas when quinine is otherwise administered the whole may be eliminated before sporulation takes place.

The intramuscular injection of salvarsan is said to be more lasting in its effects than the intravenous because of its slow absorption.

It is not necessarily the quantity of quinine that cures; it is the presence of some in the blood at the right time that is important, and for this the intramuscular injection seems to provide.

Of the other methods the rectal, which does not seem chemically to be any more reasonable, has been tried by several of my colleagues and given up because they did not find it so efficacious as the intramuscular. If you say that it is more easily and rapidly absorbed from the rectum than from the muscles the retort is "Possibly! but it does not cure them so quickly."

The intravenous is a method that can only be used by a qualified medical man; it cannot be used by dressers in estate hospitals miles away from a medical man; and, though this method may be the quickest way of getting a large quantity of quinine into the blood, it is probably the method by which elimination takes place the most quickly.

On some estates the coolies are so convinced of the superiority of the intramuscular method that, even though they cannot be persuaded to take the quinine by the mouth, they actually ask for the injections. Many Europeans, after getting tired of a long course of quinine by the mouth, ask for intramuscular injections and are benefited. It is not uncommon to hear the expression, "Quinine by the mouth is no good to me."

I do not think that either these coolies or these Europeans would ask for rectal or for intravenous injections.

Some of us feel that there may be something we do not know on the subject and would like enlightenment. At a recent meeting of our local medical society opinion was unanimously in favour of intramuscular injections—one speaking of thousands and another of about 15,000 intramuscular injections given by him or under his supervision—and we should be glad to hear of some stronger reasons than those given in your article, or in the letter by Sir Ronald Ross in the *Lancet*, before abandoning a method which seems to us not "never to have had anything to recommend it," but potent for good.

I am, yours faithfully,

J. TERTIUS CLARKE,

June 3, 1914. *Health Officer, Perak South.*

Original Communications.

SLEEPING SICKNESS IN THE LADO OF THE ANGLO-EGYPTIAN SUDAN.

By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.

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AND

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Introductory.—This paper is the first of what it is hoped will be a series of short notes on sleeping sickness in various parts of the Anglo-Egyptian Sudan, giving a condensed account of the known history and distribution of the disease associated with an attempt to define the parasite.

The experimental work has been performed in Khartoum, which is far removed from tsetse-flies and sleeping sickness. The material has been obtained by means of animals inoculated from sleeping sickness patients at Yei in the Lado Enclave of the Mongalla Province by Captain Ranken, R.A.M.C., and will be called the Yei strain or Yei trypanosome until the end of the present paper.

The only means available at the present time of differentiating trypanosomes is by comparative experiments performed as nearly as possible under the same circumstances of climate, place and time, and this is the reason why the work was not performed in a sleeping sickness area, because it was considered unjustifiable to introduce *Trypanosoma rhodesiense* into such area, as with all precautions an accident might happen the results of which might have been very terrible.

The strain of *T. rhodesiense* used was a lineal descendant of the original strain discovered by Stephens and Fantham, of the University of Liverpool, to both of whom we are deeply indebted for so kindly giving us the living trypanosomes.

Therefore the two strains to be compared in this present paper have the following origins:—

T. rhodesiense.—Lineal descendant of the original strain and brought alive from Liverpool in animals.

Yei strain.—Brought alive in an animal from Yei, the full history of which will be detailed later.

Patients were not brought to Khartoum for two reasons:—

(*a*) Danger of spreading the disease by bringing individuals with trypanosomes in their peripheral blood through as yet uninfected fly regions.

(*b*) Desire not to hinder the treatment, which drives the trypanosomes from the peripheral blood and at all events temporarily benefits the patients.

The methods adopted for fixing and staining the trypanosome were as follows:—

All films were fixed wet with osmic acid vapour for about four seconds and then plunged at once into absolute alcohol, in which they were kept for two to five minutes. They were then quickly washed with distilled water and transferred into the Giemsa's solution without allowing the films to dry.

Two Giemsa's solutions were used, viz.:—

(*A*) A solution made up of 1 c.c. of the ordinary stock stain with 10 c.c. of distilled water and two drops of a 1 in 1,000 solution of potassium carbonate in distilled water.

The films were stained in this solution for one hour or longer and were then rapidly washed in distilled water and dried.

(*B*) A solution made up of 2·5 c.c. of the ordinary stock stain with 100 c.c. of distilled water and five drops of a 1 in 1,000 solution of potassium carbonate.

The films were stained from five to twenty-four hours in this solution and then washed in distilled water and dried.

Historical.—In order to make some of our remarks intelligible to any one who may read this note, it is necessary to review the history of the discovery of the trypanosomes of sleeping sickness as we understand it, and then to pass on to a brief review of the history of sleeping sickness in the countries adjoining the Lado.

Human Trypanosomes.—The trypanosomes known to exist in man may, for our present purposes, be divided into those which cause—

(*a*) *South American trypanosomiasis* (molestia de Carlos Chagas) caused by *Trypanosoma cruzi* Chagas 1909. With this disease and its causal organism we are not at present concerned.

(*b*) *The African Trypanosomiases*, more commonly called sleeping sickness, with which we are concerned at present.

In 1901 Forde and Dutton found a trypanosome which, subsequently, received the name *Trypanosoma gambiense* Dutton 1902, in the blood of a man suffering from a peculiar type of fever on the Gambia. This trypanosome was, we believe, brought alive to Europe; but, as after many inquiries we have failed to trace its present existence, we are forced to the conclusion that "the original strain" of human trypanosomes is lost. This trypanosome was also named *T. fordii* Maxwell-Adams 28 March, 1903, and *T. gambiæ* Maxwell-Adams 28 March, 1903; other synonyms are *T. hominis* Manson 1903, and *T. nepveui* Sambon 1 July, 1903.

In 1902 Castellani found a trypanosome in the cerebro-spinal fluid of persons suffering from sleeping sickness in Uganda.

On page 9 of the First Report of the Sleeping Sickness Commission of the Royal Society Castellani says:—

> "The trypanosome found in the cerebro-spinal fluid of sleeping sickness does not, as far as I have been able to make out, differ materially in size and shape from the species one finds in the blood of trypanosome fever, *T. gambiense* (Dutton), but possibly it is to be differentiated from this one because in it, as a rule, the micro-nucleus lies nearer the extremity and the vacuole is apparently larger. Besides, its movements are not apparently so active, but this fact might be due to the effects of the centrifuge. In case it should prove to be a new species, the trypanosoma I have described might be called from the country where I have found it first, *T. ugandense*."

This name suggested by Castellani, though the paper was written in April, 1903, would bear the date

of publication in the *Proceedings of the Royal Society*, vol. lxxi, 1903, p. 501.

In the meanwhile Kruse, as Castellani points out, had suggested the name *Trypanosoma castellanii* in the "Sitzungsberichte der Niederrheinischen Gesellschaft für Natur und Heilkunde zu Bonn," dated May 18, 1903, because this is the first name to appear in print, while the name *T. ugandense* was only read before the Royal Society on May 14, 1903, and did not appear in public print till later. Therefore if, by any chance, the trypanosome found by Castellani in Uganda should prove to be different from *T. gambiense* Dutton 1902, its name would be either *T. ugandense* Castellani 1903, or, as it appeared in public print slightly earlier –

T. castellanii Kruse 1903.

The differences between these two trypanosomes is not recognized at the present time because morphologically they seem to be identical.

Matters remained in this position until the year 1910 when Stephens and Fantham advanced the view that the trypanosomes found in cases of sleeping sickness in the Loangwa Valley in Rhodesia belonged to a new species which they called—

Trypanosoma rhodesiense Stephens and Fantham 1910.

Whatever views may be held concerning this species, no one has ever doubted that it was different from *T. gambiense*, in the broadest sense of the word, and some of the experiments which will be described below show how very different it is from the trypanosomes of the Anglo-Egyptian Sudan, Mongalla Province (Old Lado Enclave), and which, from epidemiological and other reasons, is thought, by the present writers, to be probably the same trypanosome as that found in the Congo and in Uganda.

In 1913 Scott Macfie described a new trypanosome in cases of sleeping sickness in Southern Nigeria, separating it from *T. gambiense* and *T. rhodesiense* by:—

(*a*) Its morphological features.

(*b*) The peculiar symptoms of the disease produced by it.

(*c*) The slight mortality it causes in animals.

This trypanosome he names:—

Trypanosoma nigeriense Scott-Macfie 1913.

Thus in differentiating a human trypanosome, it has to be compared with:—

(1) *T. gambiense* Dutton 1902, } if these are dis-
(2) *T. castellanii* Kruse 1903, } similar.
(3) *T. rhodesiense* Stephens and Fantham 1910.
(4) *T. nigeriense* Scott-Macfie 1913.

To this point we shall return in the discussion of our observations.

Sleeping Sickness in Countries adjoining the Lado Enclave.—The countries which adjoin the Lado Enclave and which are known to be infected with sleeping sickness are:—

(1) Belgian Congo,
(2) Uganda,

and it is necessary, for the purposes of this paper, to review the known conditions of the disease in the parts of these countries which lie in proximity to the frontiers of the Lado.

(1) *The Belgian Congo.*—In order to understand the conditions under which sleeping sickness has arrived in the Belgian Congo and Uganda it is necessary to review briefly a few of the known salient points with regard to the general history of the disease in Africa.

> The reader of this note is asked to observe carefully that any dates merely signify that those are the periods during which the disease was definitely recognized at a given place and do not mean that the disease had just arrived in that locality.
>
> If it is realized how difficult the diagnosis of sleeping sickness may be and how necessary it is to confirm its presence, in the early stages, by gland puncture and the microscopical recognition of the trypanosome it will be obvious that it could be easily overlooked for years in a place in which it was present.
>
> Lastly it may be remembered that, as a rule, a native, out of politeness or fear, will say anything and agree to anything he thinks is required, and hence misleading evidence may be received as to absence from or the duration of sleeping sickness in a place.

With these preliminary remarks we will review what is known of the principal points of the history of the disease.

The earliest recorded case of sleeping sickness is the death from lethargy of the King Mansa Djata in 1373-74; at that time, it is stated, the disease was *very common* in his country, which was situate in the bend of the Niger.

In the year 1721 John Atkins, Surgeon in the Royal Navy, made a journey to the Guinea Coast, touching at Sierra Leone, places on the Gold Coast, Dahomey and Cape Lopez.

As a result of his observations he says:—

> "Whydah slaves are more subject to smallpox and sore eyes; other parts to a Sleepy Distemper, and to Windward Exomphalos's."

He also mentions "the Sleepy Distemper" in his other book entitled "The Navy Surgeon."

In 1803 Winterbottom recognized the disease as being common in the natives about Sierra Leone and gave an account of the disease, especially emphasizing the importance of the presence of enlarged glands in the neck for early diagnostic purposes.

Sleeping sickness was known to exist on the Congo when Bordier wrote in 1884.

When Corre wrote his justly celebrated book in 1887 it was recognized to extend from the Senegal River in the north to the Loango river in the south. If it is realized that, at that time, hardly anything was commonly known about West Africa Congo, it will be apparent that this only indicates the fringe of the distribution of the disease.

A curious point is to be noted in these old writings, and that is, the persistency with which the authors dwell upon the endemicity of the disease.

Thus Corre says:—

> "Endémie très limitée, et ne prenant jamais la forme épidémique."

Another feature of the disease which appears to have been missed is its duration.

Again quoting from Corre:—

> "On aurait vu des individus atteints deux, trois, cinq ans après avoir quitté les centres endémiques."

Bordier says :—

"On a vu la maladie se déclarer chez les nègres depuis longtemps (7 ans) débarqués aux Antilles."

That is to say, the disease can last longer than seven years after removal from any chance of infection, but how much longer? This question we are still unable to answer.

From this history it is quite clear that sleeping sickness was of old standing in the country enclosed in the bend of the Niger and along the West Coast of Africa from the Senegal to the Loango. It is, therefore, not surprising when we find that it was recognized at Stanley Falls on the Upper Congo in 1898, but that by no means indicated that it had just arrived there, and there is no reason to doubt that, at that period, the greater part of the Congo valley was infected, but when the original infection took place we do not know.

From this source of infection it most probably spread into the western part of the Lado Enclave, perhaps by the agency of Belgian troops or perhaps still earlier.

(2) *Uganda.*—Towards the end of the eighties of last century Stanley led a large force from the Congo to relieve Emin Pasha who was at that time at Wadelai on the Nile, where it bounds the south-eastern part of the old Lado Enclave. Christy and Hodges consider it probable that some of Stanley's people were infected with sleeping sickness and thus introduced the disease into that district and infected Emin's men.

There are several points to support this, viz.: firstly, at the present time Wadelai is known to be infected as was shown by Captain Drew, R.A.M.C.; secondly, Captain Archibald, R.A.M.C., pathologist to these laboratories, travelling northwards from Uganda to the Sudan in the early part of 1908, met with sleeping sickness north of Lake Albert and found *G. palpalis* on the road from Murchison Falls to Wadelai and on the Nile in that region.

Emin's people subsequently travelled with Stanley to Kavali on Lake Albert, which is known to be infected at the present time. Later they were moved to Busoga, known now to be heavily infected, probably since 1896. Still later they passed to Uganda where Mengo, the Sese Islands and the western shores of Victoria Nyanza became infected.

This seems to be the probable history of the source of the infection of Uganda, and seeing that it started from the southern part of the Lado now belonging to Uganda or from Lake Albert it is not surprising to find that there is a heavy infection in the south-eastern part of the Mongalla Province on the Kiyu River near Kajo-Kaji and that this infection wipes out villages and in general behaves just like the Uganda and the Congo epidemics. It is, however, but just to state that it is thought that the Kiyu epidemic was introduced from Uganda years ago by Baganda traders.

The Mongalla Province.—The present Mongalla Province was acquired for Egypt by Sir Samuel Baker and was later administered by General Gordon, and still later by Emin Pasha (Dr. Edward Schnitzler). At this time the inhabitants were being decimated by Arab slave traders to an extent that is now incredible.

The Mahdist rising in the Northern Sudan isolated this Equatorial Province, and Emin Pasha and his people were left there until rescued by Stanley's expedition in 1888. This is a memorable date, as it is believed that sleeping sickness was introduced into this part of Africa by Stanley's followers.

After the departure of Emin Pasha and his people the local inhabitants were left to war with one another at their own free wills, until during the closing years of the last century they were controlled by the Belgians who came from the West, and to whom the Lado Enclave, a territory extending along the left bank of the Nile from Albert Nyanza to 5 deg. 30 min. N. latitude, was leased in order to afford an outlet for the trade of the eastern parts of the Belgian Congo via the Nile.

This traffic, which was probably of importance in the spread of sleeping sickness, was maintained by carriers drawn from the neighbouring regions and from around the lakes.

After the death of King Leopold the Lado reverted to the Anglo-Egyptian Sudan in June, 1910.

As now constituted, the Mongalla Province is bounded—

On the North by the Upper Nile Province and a horizontal east and west line running from the Nile at about 7 deg. 40 min. N. latitude to the Abyssinian frontier.

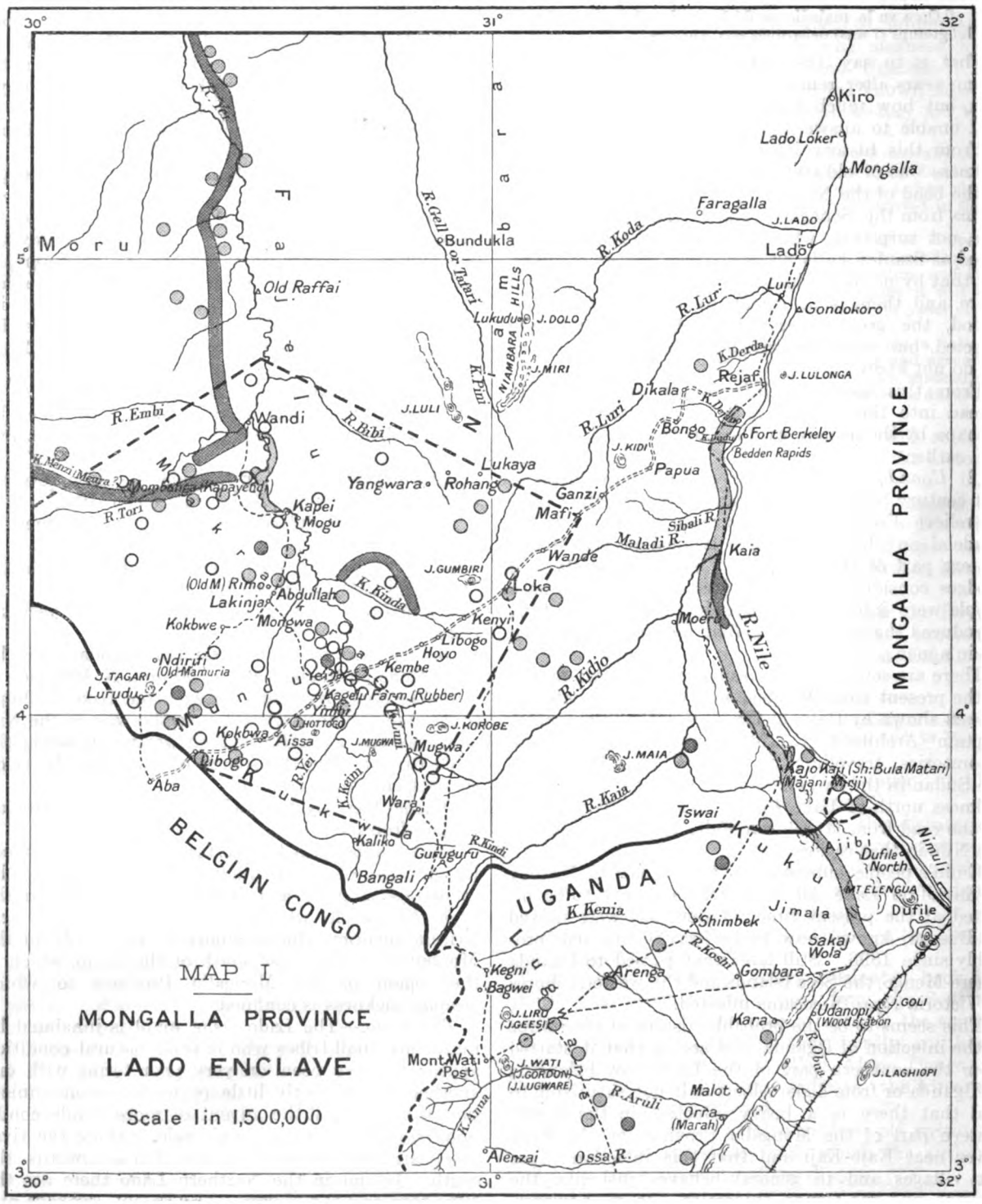
On the East by the Abyssinian boundary and by Lake Rudolph to about 3 deg. 30 min. N. latitude.

On the South by a line drawn from Lake Rudolph to Nimule and northward just to the west of the Nile as far as the Kiyu River, then westwards along the Kiyu River to near the source of the Kaya River on the Belgian Congo frontier.

On the West by the Belgian Congo and Bahr-el-Ghazal frontiers.

For the most part the western side of the province is composed of gently undulating land drained by numerous streams and inhabited especially in the Lado by people who are great wanderers. Early writers mention the existence of tse-tse fly in the Monbuttu country just south of the Lado, which is the region of the Mongallo Province to which sleeping sickness is confined.

The Lado.—The Lado (*vide* map) is inhabited by numerous small tribes who in their natural condition appear to have been on very poor terms with one another, consequently little or no inter-communication occurred until the advent of more stable conditions under the white man's rule. Along the river there are the Dinkas and the Baris towards the south. Inland in the Northern Lado there are the Nyanbaru and the Morru. The Fajelu, Avokaya and Kakwa live in the Central Lado. To their west are the Makaraka and Mundu tribes. The former are an offshoot of the Azande or Niam-Niams and are a comparatively recent intrusion in this part. In the southern part of the Lado there are the Kaliko towards the west and the Kuku on the plateau near Kajo-Kaji.



Sleeping sickness.
Sleeping sickness areas.
Glossina palpalis.
Glossina morsitans.
Provincial boundaries as regards Lado Enclave only.

The small original Mongalla Province, *i.e.*, the part of the present province to the west of the Nile and north of the Lado, was first occupied in 1901, being placed under the Governor of the Upper Nile Province, and during this time contained no sleeping sickness.

In 1909 it was felt that there was great danger of the disease spreading from the south into the little province, and special regulations were framed with the view of preventing this.

The Lado Enclave lease to Belgium being due to terminate in June, 1910, Major Mackenzie and Yusbashi Yusef Effendi Derwish were sent to investigate the conditions of sleeping sickness therein, prior to its being added to the Sudan.

They were met by the late Dr. Errara, who stated that the presence of the disease had been recognized in the Lado since 1908, and that it had extended far northwards along the Yei River (*vide* map), westwards along the Torre River, and that it was at Kiro in the north-eastern corner of the Enclave, but this was probably only an imported case, as it has not been reported from there since.

Major Mackenzie and Yusbashi Yusef found it present in many villages on the upper waters of Yembi and Kowba Rivers, also in the villages of Wata, Lasuba, Kambora, Sei, Lua, Morgan, Baraba, Lugalla (Luba) and at Bringi village near Wande. They also observed that *Glossina palpalis* was almost everywhere and that the tribes were great wanderers, a fact which tended to spread the disease. The area in which sleeping sickness was definitely seen was carefully marked out, being bounded :—

Eastwards.—Line from Bangali to Loka.

Northwards.—Line from Loka to Wande, and from Wande to Ewe.

Westwards.—Line from Ewe along the Bahr-el-Ghazal frontier to the Congo frontier.

Southwards.—Along the Belgian Congo frontier through Libogo to Bangali.

Immediately after taking over the Lado from Belgium schemes were set on foot to cope with the epidemic; and in January, 1911, a large isolation hospital was started at Yei, by Captain R. J. C. Thompson, R.A.M.C.

Later in the same year the Lado was carefully inspected by the late Colonel Mathias, R.A.M.C., P.M.O. Egyptian Army, with Captain Archibald, R.A.M.C., who reported that the natives called the disease "Kubeera Na Pongi." Colonel Mathias came to the conclusion that the disease had existed for four to five years, being introduced from Uganda by Baganda porters or from the Congo Free State by them on their return journey and by Congolese soldiers. He also mentions that some villages had been wiped out by the disease.

In the same year Mr. King, Government Entomologist, made an entomological survey of the Lado and reported that *G. palpalis* could be found at any suitable place the whole way from M'volo in the Bahr-el-Ghazal Province to Yei. He also visited the eastern part of the Lado, and mapped out the distribution of *G. palpalis* and *G. morsitans*.

Captain Drew, R.A.M.C., made a careful examination of the Enclave and wrote a most valuable report on the sleeping sickness therein, finding 218 cases in 14,976 examinations and after performing 742 gland puncture examinations. He estimates that in the area inspected he examined about 95 per cent. of the men, women and children.

In 1912 Captain Stigand drew attention to the fact that Kajo-Kaji, in the vicinity of which he had previously found *G. palpalis* and *G. morsitans*, was threatened with the disease and later in the year it was found to be infected as was Loka and Wadelai.

In the same year Captain Ranken reported that up to September 30, there had been 408 cases of the disease admitted to the isolation camp and among these there had been 88 deaths. The case infection of different villages varied very much from 22 to 0·3 per cent. In one set of 695 persons with enlarged glands in the neck 139 were proved by puncture to be due to trypanosomes.

Early in 1913, Colonel Bray, R.A.M.C., P.M.O. Egyptian Army, made a tour of inspection of the Mongalla Province and found that the area of infection had become larger, having spread northwards and eastwards.

The boundaries as described to us in June, 1914, by Captain Ranken, R.A.M.C. (*vide* map), are :—

Eastern.—From a little south of Wara through Loga to Mafi east of Wande.

Northern.—From Mafi to the Yei River and from this to where Ewe was formerly on the frontier.

Western and Southern.—From Ewe along the frontier to just south of Libogo and then to a little south of Wara.

Late in 1913 Captain Ranken found very heavy infections in the villages of Bulamatari and Jokwat situate on the Kiyu River, where about 100 cases were discovered and where it was said that whole villages had been wiped out. Captain Ranken thinks that this infection came from Baganda traders long ago.

The Kiyu River forms part of the proposed boundary between Uganda and the Sudan.

It will thus be seen that there are two main areas of infection in the Mongalla Province, viz. :—

(1) A western: centred around Yei (*vide* map) and inhabited by the Makaraka and the Mundu peoples.

(2) An eastern: adjoining Kajo-Kaji (*vide* map) and inhabited by the Kuku peoples.

It would appear as though these had arisen from two entirely separate sources of infection, viz. :—

(1) From the Belgian Congo, assisted by Baganda traders.

(2) From Uganda.

The Parasite.—Captain Ranken very kindly injected two monkeys and one dog from sleeping sickness patients at Yei Sleeping Sickness Segregation Camp. These animals were brought to Khartoum by Captain Simpson, who left Rejaf on July 21, 1913, and who arrived in Khartoum on August 10, 1913.

On examination only one monkey was found to be infected and from this animal the strain called the trypanosome of Yei was obtained.

An attempt to forward another strain in December, 1913, was unfortunately not successful, as neither the dog nor the monkey showed any infection on arrival in Khartoum, so that this present note as regards the Mongalla Province is written solely from experiments made on the first strain.

Captain Ranken has kindly supplied the following history of the case from which the monkey was inoculated:—

"The woman was an advanced case of sleeping sickness coming from Abuddal, a Makaraka village situate originally on the banks of the Yei River some twenty miles north of Yei itself, but recently moved to a distance from the river bank. The Makaraka area used to be celebrated for its ivory, and many Baganda traders formerly visited it and may possibly have been the original source of infection. It is of importance to note this fact as it indicates the same source of infection as that which has wiped out the villages of Bulamatari and Jokwat (this should be remembered in reading the account of the action of human serum on this trypanosome given below).

"Each of the animals was inoculated subcutaneously with blood, gland juice, liver blood and cerebro-spinal fluid in order to ensure infection, as the woman was the only untreated case in the camp and the trypanosomes had disappeared from the peripheral blood on the day of inoculation."

It is possible that the strain may represent that present in Uganda or present on the Congo, but this hardly matters, believing, as we do, that the Uganda infection originally came from the Congo.

It is now proposed to give certain details concerning this parasite under the following headings:—

(1) Morphology.
(2) Animal reactions.
(3) Immunity.
(4) Cross immunity.
(5) Cytolytic sera.
(6) Agglutination.
(7) Other reactions.
(8) Mode of transmission.
(9) Iconography.

(1) *Morphology.*—The minimum length was 18 microns, the maximum length was 36 microns, the variation being 18 microns. The minimum breadth was about 1 micron, the maximum breadth was 2·5 microns measured across the widest part.

The average length of 1,000 non-dividing trypanosomes measured in the usual way was 25 microns. The distribution according to length of 1,000 non-dividing forms measured by one hundred per diem from the blood of an infected monkey, *Lasiopyga callitrichus* (I. Geoffroy 1851), and drawn by means of a camera lucida at a magnification of 1,000 diameters and measured by the tangent method, is set forth in Tables I, II and III, and in Chart I.

The history of the monkey is as follows:—

It was inoculated subcutaneously on January 8, 1914, with citrated blood of a gerbil, *Gerbillus pygargus*, which was in the early stages of the disease. Ten days later, *i.e.*, on January 18, for the first time the monkey showed a heavy infection and the count was started and completed on January 27. The monkey died on February 9.

YEI STRAIN.

Graphical representation of 1,000 Trypanosomes from one monkey, *Lasiopyga callitrichus*. (I. Geoffrey, 1851.)

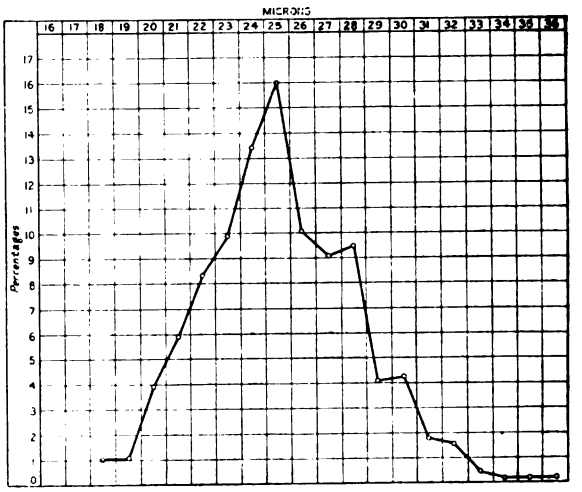


CHART I.

The measured trypanosomes were therefore taken from the tenth to nineteenth day inclusive of an infection lasting about thirty-three days.

A posterior nuclear position has, so far, never been observed by us in this trypanosome.

(2) *Animal Reactions.*—Briefly it may be stated that its virulence in dogs, cats, rabbits, gerbils, jerboas, white rats and monkeys is distinctly less than that produced by *Trypanosome rhodesiense* Stephens and Fantham, but more marked than that recorded for *T. nigeriense* Scott-Macfie.

The average duration of life in infections with this parasite is as follows:—

Dog	Incubation, 12 days; average length of life, more than 40 days, often several months.
Monkey	Incubation about 9 days; average length of life, 35·5 days.
Gerbil	Incubation, 7 days; average length of life, 14·6 days.

(3) *Immunity.*—A dog was rendered immune, *i.e.*, its peripheral blood had failed to show trypanosomes for more than sixty-one days after receiving its fifth inoculation with the Yei strain. The last tested gerbil inoculated with this dog's blood failed to develop an infection.

The serum of the dog, when fully immune, destroyed the *Trypanosome from Yei* in twenty minutes *in vitro*, but had no effect on *T. rhodesiense*, after one hour, *i.e.*, the serum destroyed the homologous but not the heterologous trypanosome. In these observations we confirm the work of Mesnil and Ringenbach as quoted by Stephens and Fantham.

When partially immune the serum was taken and

TABLE I.—DISTRIBUTION IN RESPECT TO LENGTH OF 1,000 NON-DIVIDING INDIVIDUALS OF YEI STRAIN OF TRYPANOSOMES IN A SINGLE MONKEY, *Lasiopyga callitrichus* (I. Geoffroy 1851).

		In Microns																					Average	
		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Of each 20	Of each 100
1st day	1	..	..	..	..	..	2	2	4	3	..	4	2	2	1	..	..	..	..	..	..	..	..	..	22·65	
	2	..	..	..	..	..	1	1	5	5	2	2	2	1	1	..	..	..	..	..	..	..	..	..	22·55	
	3	..	..	..	..	..	..	3	5	2	4	2	3	1	..	..	..	..	..	..	..	..	..	..	22·50	22·74
	4	..	..	..	..	1	..	3	..	4	8	2	1	1	..	..	..	..	..	..	..	..	..	..	22·45	
	5	..	..	..	..	..	..	2	3	4	–	2	5	2	1	1	..	..	..	..	..	..	..	..	23·55	
2nd day	1	..	..	..	..	1	–	3	2	3	1	5	1	2	1	1	..	..	..	..	..	..	..	..	23·05	
	2	..	..	..	..	–	–	–	–	2	4	5	5	2	1	1	..	..	..	..	..	..	..	..	24·40	
	3	..	..	..	..	..	..	2	1	1	6	3	2	1	1	1	–	2	..	..	..	..	..	..	24·20	24·14
	4	..	..	..	..	..	1	–	3	1	3	5	3	2	–	2	..	..	..	..	..	..	..	..	23·80	
	5	..	..	..	..	..	..	..	..	..	5	3	4	2	4	1	–	1	..	..	..	..	..	..	25·25	
3rd day	1	..	..	..	..	..	..	1	1	2	5	2	4	1	–	3	–	1	..	..	..	..	..	..	24·40	
	2	..	..	..	..	..	..	1	2	2	1	6	4	1	2	–	1	..	..	..	..	..	..	..	24·10	
	3	..	..	..	..	1	–	–	–	5	3	2	3	3	2	1	..	..	..	..	..	..	..	..	24·00	23·99
	4	..	..	..	..	..	1	–	1	3	1	3	5	3	1	2	..	..	..	..	..	..	..	..	24·35	
	5	..	.	..	..	1	–	2	1	4	5	1	3	1	1	1	..	..	..	..	..	..	..	..	23·10	
4th day	1	..	..	..	..	..	1	1	–	1	–	2	2	1	6	–	2	1	1	2	..	..	..	..	26·50	
	2	..	..	..	..	1	–	–	2	2	2	6	4	–	–	1	–	2	–	–	..	..	..	..	24·10	
	3	..	..	..	..	1	–	3	2	–	–	2	1	4	3	2	–	1	1	..	..	..	..	..	24·75	25·05
	4	..	..	..	..	..	..	1	1	1	3	4	4	1	1	1	1	1	1	..	..	..	..	..	24 95	
	5	..	..	..	..	1	–	–	1	1	–	3	7	1	4	1	1	–	–	..	..	..	..	..	24·95	
5th day	1	..	..	..	..	..	..	1	–	1	2	1	4	2	3	3	1	2	–	..	..	..	..	..	25·90	
	2	..	..	..	..	..	..	..	3	2	2	3	1	1	3	3	–	1	1	..	..	..	..	..	25·25	
	3	..	..	..	..	..	..	..	1	2	1	2	3	2	1	1	4	2	–	–	1	..	..	..	25·35	25·87
	4	..	..	..	..	1	–	–	–	2	1	2	2	5	2	4	1	..	..	..	..	..	..	..	25·40	
	5	..	..	..	..	..	..	..	..	2	1	2	5	–	2	2	2	3	1	..	..	..	..	..	26 45	
6th day	1	..	..	..	..	..	..	1	2	–	–	1	6	2	3	4	–	–	1	..	..	..	..	..	25·60	
	2	..	..	..	..	..	..	..	1	3	–	4	5	–	3	1	1	1	–	1	..	..	..	..	25·40	
	3	..	..	..	..	..	..	1	1	–	2	4	1	5	1	1	–	3	1	..	..	..	..	..	26·20	25·51
	4	..	..	..	..	..	..	2	1	1	4	2	1	3	2	2	2	–	..	..	..	..	..	..	24·70	
	5	..	..	..	..	..	..	..	1	2	2	1	4	1	5	1	1	2	..	..	..	..	..	..	25·65	
7th day	1	..	..	..	..	..	..	1	2	1	4	3	4	1	–	1	2	–	1	..	..	..	..	..	24·55	
	2	..	..	..	..	..	..	..	..	2	–	3	4	5	–	3	–	1	1	1	..	..	..	..	26·15	
	3	..	..	..	..	1	1	–	–	–	2	3	2	2	4	2	2	–	1	..	..	..	..	..	25·50	25·46
	4	..	..	..	..	..	..	..	1	–	1	1	5	3	2	2	2	2	1	..	..	..	..	..	26·50	
	5	..	..	..	..	..	1	1	–	1	2	6	3	2	1	1	1	1	..	..	..	..	..	..	24·60	
8th day	1	..	..	..	..	..	1	4	1	4	5	1	2	2	..	..	..	..	..	..	..	..	..	..	22·45	
	2	..	..	..	..	..	..	..	1	–	2	3	6	–	3	3	1	1	..	..	..	..	..	..	25·15	
	3	..	..	..	..	1	1	–	2	3	1	5	3	1	2	1	..	..	..	..	..	..	..	..	23·55	23·69
	4	..	..	..	..	..	1	1	3	3	3	2	2	2	1	1	1	..	..	..	..	..	..	..	23·55	
	5	..	..	..	..	..	..	1	2	3	1	5	6	1	–	1	..	..	..	..	..	..	..	..	23·75	
9th day	1	..	..	..	..	..	..	..	..	..	2	2	3	3	6	2	–	–	–	2	..	..	..	..	26·45	
	2	..	..	..	..	..	..	..	1	1	–	5	4	3	–	4	1	–	1	..	..	..	..	..	25·65	
	3	..	..	..	..	..	..	..	..	..	2	1	3	5	4	4	–	1	..	..	..	..	..	..	26·25	26·31
	4	..	..	..	..	..	..	..	1	2	1	1	4	1	2	2	4	1	–	1	..	..	..	..	26·30	
	5	..	..	..	..	..	..	..	..	1	1	–	1	3	5	7	1	1	..	..	..	..	..	..	26·90	
10th day	1	..	..	..	..	..	..	..	..	..	..	1	2	4	–	1	4	2	2	2	..	1	..	1	28·90	
	2	..	..	..	..	..	..	..	..	..	1	–	2	1	1	4	1	4	1	3	1	..	1	..	29·10	
	3	..	..	..	..	..	..	1	–	–	–	1	3	2	1	8	–	1	–	1	2	..	..	..	27·50	28·05
	4	..	..	..	..	..	..	..	..	1	2	2	1	3	1	4	–	2	2	2	..	..	..	..	27·20	
	5	..	..	..	..	..	..	..	..	..	..	2	2	3	2	4	3	3	–	1	..	..	..	..	27·55	
Totals		..	..	..	..	10	11	39	58	83	98	133	159	100	90	96	40	43	17	16	4	1	1	1	Average length of 1,000 is 25·071	

TABLE II.—SUMMARY OF MEASUREMENTS (IN MICRONS) OF LENGTHS OF 1,000 INDIVIDUALS OF *T. yei* STRAIN FROM A SINGLE MONKEY, *Lasiopyga callitrichus*.

		Maximum	Minimum	Averages of each 100	Averages of each 20	Range of averages of each 20
	1	27	19		22·65	
	2	27	19		22·55	
1st day	3	26	20	22·74	22·50	1·10
	4	26	18		22·45	
	5	28	20		23·55	
	6	28	18		23 05	
	7	28	22		24·40	
2nd day	8	30	20	24·14	24·20	2·2
	9	28	19		23·80	
	10	30	23		25·25	
	11	30	20		24·40	
	12	29	20		24·10	
3rd day	13	28	18	23 99	24·00	1·3
	14	28	19		24·35	
	15	28	18		23 10	
	16	32	19		26·50	
	17	30	18		24·10	
4th day	18	31	18	25·05	24·75	2·4
	19	31	20		24 95	
	20	29	18		24·95	
	21	30	20		25·90	
	22	31	21		25·25	
5th day	23	33	21	25·87	26·35	1·2
	24	29	18		25·40	
	25	31	22		26·45	
	26	31	20		25·60	
	27	32	21		25·40	
6th day	28	31	20	25·51	26 20	1·3
	29	29	20		26 70	
	30	30	21		25·65	
	31	31	20		24·55	
	32	32	22		26·15	
7th day	33	31	18	25·46	25·50	1·95
	34	31	21		26·50	
	35	30	19		24·60	
	36	26	19		22·45	
	37	30	21		25·15	
8th day	38	28	18	23·69	23·55	2·7
	39	29	19		23·55	
	40	28	20		23·75	
	41	32	23		26·45	
	42	31	21		25 65	
9th day	43	30	23	26·31	26·25	1·25
	44	32	21		26·30	
	45	30	22		26 90	
	46	36	24		28·90	
	47	35	23		29·10	
10th day	48	33	20	28·05	27·50	1·9
	49	32	22		27·20	
	50	32	24		27 55	
					Range =	29·10
						22·45
						6·65

inoculated into gerbils *immediately* after mixture with the trypanosomes. The results were as follows:—

Trypanosome of Yei: An infection resulted from which the animal was recovering when it died of heat stroke, on the same day with forty-nine other animals, *i.e.*, on the thirty-ninth day after inoculation.

T. rhodesiense: An infection resulted which killed the animal on the seventh day after inoculation.

When completely immune the serum was taken and after being in contact with the trypanosomes (1 c.c. of the serum to 0·1 c.c. of infected blood, both infections being as nearly as possible of the same apparent strength) for thirty minutes, was inoculated into gerbils:—

Trypanosome from Yei: No trypanosomes seen in the peripheral blood of the inoculated gerbil, but the animal was accidentally killed two days fourteen hours after inoculation. It showed no trypanosomes in the internal organs, but peculiar bodies were seen in the cells of lung smears, comparable with the granules found by Archibald in the spleens of kala-azar patients and of animals inoculated with kala-azar. These granules are quite different from the infective granules described by Fry and Ranken.

T. rhodesiense: The gerbil became infected and died in ten days.

TABLE III.—*T. yei* STRAIN IN WHICH THE TRYPANOSOMES ARE ARRANGED IN BRUCE'S THREE GROUPS: (*a*) 13—21 μ; (*b*) 22—24 μ; (*c*) 25 μ AND UPWARDS.

Day	1	2	3	4	5	6	7	8	9	10	Totals
(*a*) Stumpy, 13—21 μ	32	13	12	15	6	10	8	19	2	1	118
(*b*) Intermediate, 22—24 μ	44	47	45	27	26	26	29	41	19	10	314
(*c*) Long, 25—36 μ	24	40	43	58	68	64	63	40	79	89	568
Totals	100	100	100	100	100	100	100	100	100	100	1,000

TABLE IV.—IMMUNITY EXPERIMENTS IN VITRO.

Animal	Immune serum + *Trypanosome from Yei*	Immune serum + *T. rhodesiense*
Dog immunized against *Trypanosome from Yei* in the Lado.	All trypanosomes dead in twenty minutes.	Trypanosomes alive at end of one hour.
Goat immunized against *T. rhodesiense*, original strain of Stephens and Fantham 1910.	Trypanosomes alive at end of one hour.	All trypanosomes dead in twenty minutes.

TABLE V.—IMMUNITY EXPERIMENTS IN VIVO.

Immune serum	Gerbil inoculated with immune serum + *Trypanosome from Yei*	Gerbil inoculated with immune serum + *T. rhodesiense* original strain
From dog partially immunized against the *Trypanosome from Yei*. The inoculation of the gerbils was made immediately after mixing with the immune serum.	Inoculated 9.4.14; showed trypanosomes 15.4.14; good infection 17.4.14; after which trypanosomes diminished and the animal was in apparently good health on 17.5.14. when it died of heat stroke with forty-nine other healthy and inoculated animals, *i.e.*, thirty-nine days after inoculation.	Developed severe trypanosomiasis and died on seventh day after inoculation.
From dog completely immunized (*i.e.*, gerbil inoculated with its blood did not develop trypanosomiasis) against the *Trypanosome from Yei*. Trypanosomes left for thirty minutes in contact with serum before injection into gerbils.	Did not show any trypanosomes but was killed accidentally two days and fourteen hours after inoculation. No trypanosomes to be found in internal organs, but peculiar bodies in lung cells identical with those found by Archibald in spleens of kala-azar patients and of animals inoculated with kala-azar.	Developed severe trypanosomiasis and died on the tenth day after inoculation.
From goat immunized against *T. rhodesiense*, original strain. Trypanosomes left for twenty minutes in contact with serum before inoculation into gerbils.	Developed severe trypanosomiasis and died on fourth day after inoculation.	Alive and apparently in its usual health one month after inoculation, and has not shown trypanosomes in its peripheral blood. The gerbil was now killed and films made from the lungs, spleen and liver, but no trypanosomes were found.

(4) *Cross Immunity.*—The immunized animal was used for a cross immunity experiment which we propose to detail in a subsequent paper.

(5) *Cytolytic Sera.*—We have tried the effect of normal human blood serum upon several strains of trypanosomes.

The technique used was to take 0·5 c.c. of the serum and to add to it 0·025 of the infected blood containing as far as possible equivalent numbers of trypanosomes. The experiments were conducted at room temperature, *i.e.*, 102° F.

The results may be summarized briefly by saying that no trypanolysis, worthy of record, took place with two strains of mule trypanosomes, with *T. rhodesiense* original strain, or with the *Trypanosome from Yei* which we are considering.

The human serum certainly slowed the movements of *T. rhodesiense* but it was not observed to destroy any during the space of one hour.

It did not appear to be beneficial to the mule strains.

With regard to the Yei strain the human serum appeared to have a distinctly beneficial action, as at the end of one hour's microscopical examination *in vitro* the trypanosomes were in excellent condition and more active than at the commencement of the experiment.

This beneficial action of human serum on the Yei strain of trypanosome may perhaps explain, at all events in part, the epidemic character of the attack in the Eastern Lado as well as the high mortality in that region.

The only sera which we have observed to produce trypanolysis have been strongly immune sera which destroyed the homologous trypanosomes in a most remarkable manner but did not act on heterologous trypanosomes.

(6) *Agglutination.* — We have observed strong though incomplete agglutination of a strain of trypanosomes from a gerbil and derived originally from a mule by mixing 0·025 c.c. of the infected blood with 0·5 c.c. of normal human blood serum.

If this is admitted it is obvious that agglutination, as a specific test, is useless for the recognition of a trypanosome.

(7) *Other Reactions.* — We have not used such methods as phagocytosis, attachment, complement deviation, &c., as other observers have found them to be unsuitable for the purpose of the differential diagnosis of a trypanosome. We have only performed a few experiments with trypanolytic drugs and quickly came to the conclusion that this form of research would not help our present purpose.

(8) *Mode of Transmission.* — We have made no experiments under this heading, nor are, in our opinion, any necessary if we are correct in our recognition of the species of trypanosome (*vide infra*) which we have received from Yei as the brilliant discoveries of Sir David Bruce and his co-workers have sufficiently proved that it is spread by *Glossina palpalis* (Robineau-Desvoidy, 1830).

TRYPANOSOMA RHODESIENSE.

Graphical representation of 1,000 Trypanosomes from one Rat (white). (Stephens and Fantham, 1913.)

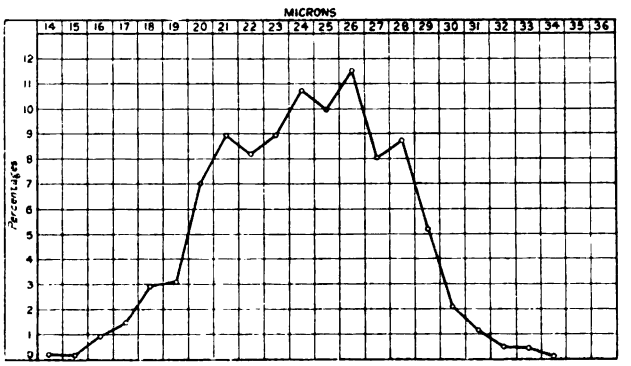


CHART II.

(9) *Iconography.*—We give no photomicrographs of this strain as we believe it (*vide infra*) to be the

same as the Uganda strain which has been so beautifully depicted by Lady Bruce in plate 13 of vol. 84, series B, of the *Proceedings of the Royal Society* for 1911.

Comparison with other Trypanosomes.—The differences and the similarities of this trypanosome with the other known human trypanosomes will now be discussed in the following order:—

(I) *T. rhodesiense.*
(II) *T. nigeriense.*
(III) *T. gambiense*, Congo strain.
(IV) *T. gambiense*, Uganda strain.

(I) *T. rhodesiense* Stephens and Fantham 1910. The trypanosome from Yei differs from *T. rhodesiense* in that:—

	Trypanosome from Yei		*T. rhodesiense*
(1) Maximum length	36	against	34 microns.
(2) Minimum length	18	,,	14 ,,
(3) Average length ..	25	,,	24 ,,
(4) Curve of 1,000 lengths	*Vide* Chart I.	,,	*Vide* Chart II.
(5) Posterior nucleation	Not observed	,,	Present.
(6) Animal reactions	Less virulent	,,	More virulent.
(7) Yei immune serum reactions—			
(*a*) *In vitro*	Destruction of trypanosomes	,,	No destruction.
(*b*) *In vivo*..	Destruction of trypanosomes	,,	Development of disease and death.

TRYPANOSOMA NIGERIENSE.

Graphical representation of 1,000 Trypanosomes from one Guinea-pig. (Scott Macfie, 1913.)

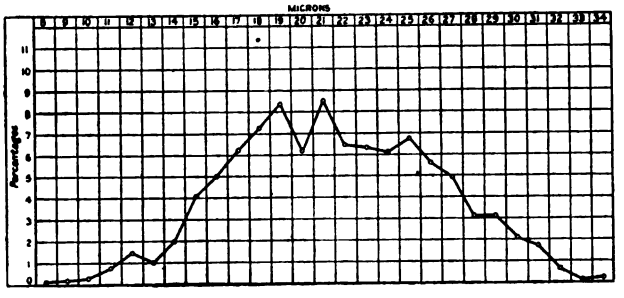


CHART III.

(II) *T. nigeriense* Scott-Macfie 1913. It differs from this trypanosome in that:—

	Trypanosome from Yei		*T. nigeriense*
(1) Maximum length	36	against	34 microns.
(2) Minimum length	18	,,	8 ,,
(3) Average length ..	25	,,	21 ,,
(4) Curve of 1,000 lengths	*Vide* Chart 1	,,	*Vide* Chart 3.
(5) Anterior nucleation	Not marked..	,,	Marked in small forms.
(6) Animal reactions	More virulent; monkeys die in about 36 days after inoculation	,,	Less virulent; monkeys alive and well on an average 127 days after inoculation.

In making these comparisons decimal figures have not been considered.

We have found no records of immunity and transmission experiments with *T. nigeriense* except two observations by Scott-Macfie, indicating a possible development of *T. nigeriense* in the gut of Stomoxys.

We have thus shown that the trypanosome from Yei is neither *T. rhodesiense* nor *T. nigeriense.*

TRYPANOSOMA GAMBIENSE.

Graphical representation of 1,000 Trypanosomes in one Rat (white). (Stephens and Fantham 1913.)

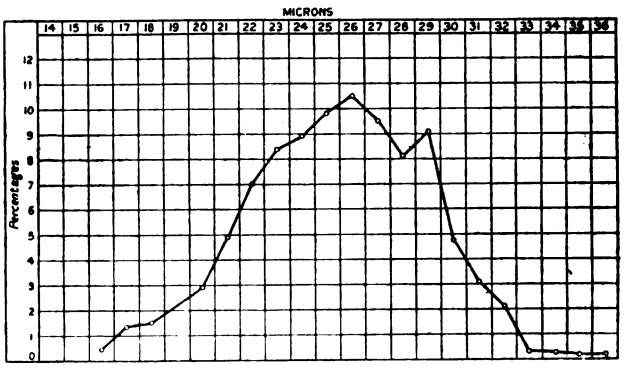


CHART IV.

(III) *T. gambiense, Congo strain.*—It is now necessary to compare this trypanosome with a known strain of *T. gambiense* (*sic*) and this can be done by taking the strain ably described by Stephens and Fantham in the "Annals of Tropical Medicine and Parasitology," 1913, vol. vii, No. 1, p. 27, which, according to Professor Stephens, was obtained from Professor Mesnil in 1905 who, according to Dr. Fantham, obtained it from a case of sleeping sickness from the French Congo.

	Trypanosome from Yei		*Trypanosome from Congo*
(1) Maximum length ...	36	against	36 microns
(2) Minimum length ...	16	,,	16 ,,
(3) Average length ...	25·017	,,	24·867 ,,
(4) Curve of lengths ...	Chart I.	,,	Chart 4

Mesnil and Ringenbach have demonstrated that the immune serum protects against the homologous but not against the heterologous trypanosome when *T. gambiense* (*sic*) is compared with *T. rhodesiense* and *vice versa.* With regard to their immunity experiments it is not definitely known whether the strain of *T. gambiense* (*sic*) used was the same as that described by Stephens and Fantham.

It is concluded that the trypanosome from Yei is not dissimilar from the trypanosome of the French Congo.

(IV) *T. gambiense, Uganda strain.*—With regard to the trypanosome found in Uganda, it is not possible to compare the measurements exactly, as the 1,000 trypanosomes measured by Surgeon-General Sir David Bruce, F.R.S., were taken from man, chimpanzees, monkeys, oxen, antelope and rats, whereas our measurements were made from a single animal on ten successive days of its infection.

Notwithstanding this, there is a curious similarity, the proportions being the same, only there is everywhere a difference of 3 microns and the curves very much resemble one another.

	Trypanosome from Yei	*Trypanosome from Uganda*	Difference
(1) Maximum length ...	36	33	– 3 microns
(2) Minimum length ...	16	13	– 3 ,,
(3) Average length ...	25·0	22·1	– 3 ,,
(4) Curve of length ...	Chart I.	Chart V.	..

One cannot help being surprised at the remarkable similarity of the result, considering the very different manner in which the two sets of results were obtained.

TRYPANOSOMA GAMBIENSE.

Graphical representation of 1,000 Trypanosomes in man and various animals. (Surgeon-General Sir David Bruce, F.R.S., 1911.)

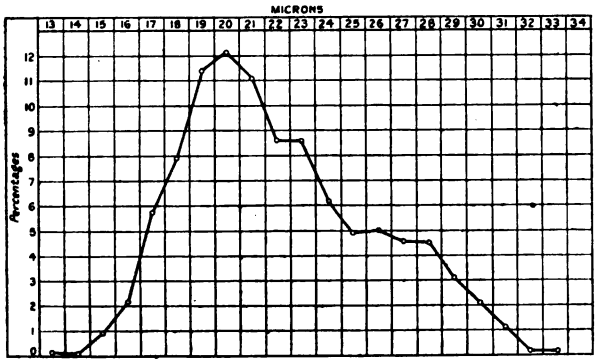


CHART V.

The explanation of the systematic smaller size of the Uganda trypanosome is obtained by comparing our results with those of Sir David Bruce and Stephens and Fantham when divided into Sir David Bruce's three classes :—

Strain	Short, stumpy, 13-21 microns	Intermediate 22-24 microns	Long and slender, 25 microns and upwards
Uganda strain ...	51·2	23·1	25·7
Congo strain ...	18·2	27·0	54·8
Yei strain	11·8	31·4	56·8

It is seen that Sir David Bruce's strains have a preponderance of short stumpy forms but in our opinion this does not prevent them from being the same trypanosome as that examined by Stephens and Fantham and by ourselves, and we are supported in this view by the measurement of the breadth, our minimum being about one micron against Sir David Bruce's 1·5 microns and our maximum 2·5 microns against Sir David Bruce's 2·5 microns.

We have made a preliminary study of the variations in length of a given trypanosome and, with all reserve, we have provisionally come to the conclusion as the result of our observations that the same trypanosome in the same animals may show at times an excess of long and slender forms and at other times an excess of short and stumpy forms.

We are inclined to think that inoculations made from recently infected animals tend to produce increased numbers of long and slender forms while inoculations made from late infections tend to produce short and stumpy forms; we also consider that it may require more than one passage to produce the result.

If we are correct in this, it might partially explain the uniform discrepancy in the measurements given by Sir David Bruce, and a further explanation might be the number of different hosts used by Sir David Bruce, as compared to one host used by Stephens and Fantham and by ourselves, and lastly perhaps the difference in technique (*e.g.*, the compass versus the tangent method, &c.) may also help to explain the difference.

With regard to animal reactions we scarcely meet on common ground, as the conditions under which our animals live must be very different from those under which the Uganda animals lived. Besides this, we can only find one common animal, viz., *Lasiopyga callitrichus* (I. Geoffroy 1851). The duration of infections observed in this monkey may be tabulated as follows :—

Strain	Incubation period	Duration of life
Uganda (Sir D. Bruce) ..	9-40 days ..	2½-12 months
Uganda (Bentmann and Günther)	10 ,, ..	82 days
Yei	9 ,, ..	36 ,,

In other words, the incubation of the disease more or less agrees, but the trypanosome from Yei appears to be more virulent. This, however, may be only apparent and not real, being simply due to the trying climatic conditions under which the animals were compelled to live in Khartoum.

We cannot find records of immunity and cross immunity experiments in which the Uganda strain (definitely stated) is compared with strains from other regions.

Conclusions.—We consider we have brought forward sufficient evidence to show that the trypanosomes which we found in the infected animal sent by Captain Ranken, R.A.M.C., and the Congo strain are the same, and that in all probability they and the Uganda strains are also the same. There being no data, that we know of, to compare these strains with *T. gambiense* Dutton 1902, we are of the opinion that at all events provisionally it would be safer to keep the name

"*Trypanosoma castellanii* Kruse 1903"

for these strains until more light is thrown upon the complicated problem of "What is *T. gambiense* Dutton 1902?"

It would appear to us as though the sleeping sickness of Africa could be divided into the following categories :—

(*A*) *Southern sleeping sickness* caused by *T. rhodesiense* Stephens and Fantham 1910, and spread by *Glossina morsitans* Westwood 1850.

(*B*) *Equatorial sleeping sickness* caused by *T. castellanii* Kruse 1903, and spread by *G. palpalis* (Robineau-Deavoidy 1830).

(*C*) *Northern sleeping sickness* which may be caused by as yet imperfectly known trypanosomes named—

(*a*) *T. gambiense* Dutton 1902,

(*b*) *T. nigeriense* Scott-Macfie 1913, and perhaps also by some as yet unknown trypanosomes.

With regard to Sir David Bruce's method of measuring and charting a large number of trypanosomes our observations support the view that this method, if carefully carried out, of comparing these parasites one with another is probably of distinct value and not merely a matter of coincidence as has been maintained recently by Yorke and Blacklock.

Laveran and Mesnil's methods of differentiation by immunization and cross immunization are also, in our opinion, of distinct value.

Further Investigations.—There is, however, a complication to be remembered with regard to the Lado Enclave which, stated in the form of a question, is as follows:—

Why are so many of the cases exceedingly chronic, while others are very acute?

This question is capable of being answered in two ways:—

(*a*) Because the disease has been for some time endemic in the western part of the Lado in which the chronic cases are found and more newly introduced into the part on the east where the acute cases occur. This is supported by evidence given to the writers by Captain Archibald, R.A.M.C., and Captain Ranken, R.A.M.C., and is probably the solution.

(*b*) Because there are two different forms of sleeping sickness. This is not so likely.

Steps have already been taken to enable work to be done to attempt to elucidate these points.

Acknowledgments.—We wish to draw attention to the fact that it would have been impossible to have done the work contained in this paper without the generous help of Lieutenant-Colonel Bray, R.A.M.C., Principal Medical Officer of the Egyptian Army and President of the Sleeping Sickness Commission of the Anglo-Egyptian Sudan, and Captain Ranken, R.A.M.C., of the Sleeping Sickness Commission, to both of whom we are much indebted.

We desire to express our gratitude for the kindness which we have received from Captain Drew, R.A.M.C., in supplying us with epidemiological data and giving us other kind assistance. We also desire to thank Captain Archibald, R.A.M.C., Pathologist to these Laboratories, for many kind suggestions, and for checking our experiments, Mr. Grabham, Government Geologist, for his kind interest in this paper, and Mr. Alexander Marshall, Senior Bacteriological Assistant, for much kind help.

We are much obliged to the Director of Surveys for the map of the Lado Enclave.

Finally, we desire to express our indebtedness to Dr. Bagshawe and his collaborators in those valuable publications—*The Bulletins of the Sleeping Sickness Bureau* and *The Tropical Diseases Bulletin*—without which the task of writing this short note would have been rendered much more difficult.

Khartoum, July 12, 1914.

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Illustrations.

(A) Map of the Lado Enclave belonging to the Mongalla Province.

(B) Charts of Lengths of Trypanosomes.

Chart I.—Yei strain of trypanosome	*T. castellanii* Kruse 1903.
,, II.—*T. rhodesiense* made by Stephens and Fantham	*T. rhodesiense* Stephens and Fantham 1910.
,, III.—*T. nigeriense* made by Scott-Macfie	*T. nigeriense* Scott-Macfie 1913.
,, IV.—*T. gambiense* made by Stephens and Fantham	*T. castellanii* Kruse 1903.
,, V.—*T. gambiense* made by Sir David Bruce, F.R.S.	,, ,, ,,

THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 15, 1914.

A SCHOOL OF ORIENTAL STUDIES.

IN early summer of the current year a considerable amount of interest was taken in the formation of a school of Oriental studies—in other words Oriental languages—in London. We were favoured by a circular at the time drawing attention to the need of funds to supplement what had already been promised by the Home Government, by the Government of India, and by the Education Committee of the London County Council. That the establishment of the school met with the approval of Government was evident, and substantial sums, amounting in all to £7,250 yearly, had been promised towards the total of the £14,000 stated to be the annual sum necessary to keep the school going. Attention is drawn to the fact in the circular, that whilst in Germany, France, Russia and Italy schools of this kind are in being, and supported financially in every instance by their several States, in Britain nothing of the kind is attempted. This statement does not quite represent the state of affairs, for there is scarcely a university in the realm in which the teaching of an Oriental language is not provided for. Hebrew professors or lecturers are attached to the divinity faculty of our universities, and in 1887 a serious attempt was made by the Imperial Institute to establish teaching centres of Oriental languages at the Institute itself, and at University College and at King's College, London. At the colleges teaching still is conducted, but for some reason the interest seemed to flag. It is hoped by the establishment of "the School of Oriental Studies" now advocated to contribute "a new pillar of Empire and Commerce" to the advantage of this country.

The fresh attempt has H:M. the King as its patron, a departmental committee appointed by the Secretary of State for India, and a city executive appeal committee composed of men of position and influence. The school is to be housed at the London Institution, Finsbury Circus, London, E.C., and it is intended to commence teaching in 1915.

The difference between the new and past attempts to advance interest in Oriental languages is that heretofore the subject has been dealt with as one of academic or political interest merely, the devotees to which have been and must necessarily be limited, whereas it is now intended to regard the matter as one of commercial importance, having wide and direct interests and immediate monetary value. So keen is commercial competition to-day that the leading bankers and merchants in Britain feel that their representatives are handicapped in comparison with men from several other countries, inasmuch as they are ignorant of the languages of the peoples they are brought into contact with, whilst their rivals have been taught to speak and read these languages. Gradually has this belief grown up amongst us, being enforced by loss of trade to the country and decline of prestige. The attempts made to meet the conditions of modern commerce have been few, and from want of encouragement and opportunity our young men go abroad badly equipped for their duties. So acutely was the situation felt that, to quote from the papers, "in 1907 the Prime Minister, who was then Sir Henry Campbell-Bannerman, appointed a committee, with Lord Reay as chairman, which put forward certain recommendations of great value and importance. Then, in 1910, three years afterwards, Lord Morley, who was at the time Secretary of State for India, appointed a Departmental Committee to organize a scheme for a School of Oriental Languages upon the lines recommended by Lord Reay's committee. Finally, on May 6 in the present year, the scheme was supported by a large and representative meeting of Members of Parliament, City merchants, and scholars, held under the presidency of the Lord Mayor, at the Mansion House. At last, Great Britain seems to have realized the greatness of her need. And how do matters stand? In the first place, a site for the new school has been found in the buildings of the London Institution, secured for the school by Act of Parliament. His Majesty the King has graciously consented to be the patron of the school, which is to be attached to the University of London, under the terms of a Royal Charter. The Government has also promised the sum of from £20,000 to £25,000 necessary for alterations and repairs, and the building of a new block of class rooms. As we said just now, in order that the school may have its full efficiency, we require an annual income of £14,000 a year. How is this sum to be made up? The Government have promised £4,000, the Government of India £1,250, and the Education Committee of the London County Council have recommended the contribution of £2,000 a year under certain conditions. What is still required is something like £6,700 a year, and it is for this sum that an appeal is now being made—an appeal for annual grants, subscriptions, and so forth—in order that an endowment fund of not less than £100,000 should be raised. No words of ours are necessary to recommend so beneficent a project to the practical sympathies of the nation at large. Commercially, there can be no doubt of the value of a knowledge of Eastern languages. How is a trader to compete with his rivals, how is he to develop his own business, unless he knows how to converse with the natives, not merely through an interpreter, and unless he succeeded in imbibing something of the spirit of the East? But our Imperial responsibilities touch wider issues. Since the time when the merchant adventurers, the founders of the great commercial houses connected with the East, and the bankers, generally, recruited from the city of London itself, went forth in the spacious times of Queen Elizabeth and her successor, James, British power and influence have grown into so huge and colossal a structure that we become almost appalled at the vast and intricate series of relations which unite this island with the teeming millions of the

East. That we should any longer allow the development of our Empire to be presided over by chance and accident, is an unthinkable proposition. We must know the spirit and temper of the peoples with whom we have to deal, and for this purpose it is absolutely necessary that we should know their languages. On both grounds, commercial and imperial, a school of Oriental Languages in London is one of the most imperative needs of our time."

It is to be hoped the stimulus given to the acquirement of Oriental languages by the commercial community will be ably supported by the banking and commercial firms dealing with the East. At present the candidates seeking employment in banks, commercial firms, rubber and tea estates, &c., are required to be able to produce a leaving school certificate, and to know typewriting and shorthand: accomplishments not demanding either much education or mental abilities of a high order. It remains to be seen whether the employees will be given time to acquire a language whilst they are being trained in their ordinary clerking work in the London office of the firm. They are fairly hard worked as it is, as the majority who join are quite young lads and not physically quite up to standing the strain put upon them at present, and to add the acquisition of one or two languages in addition may prove a tax upon their time and strength which might be detrimental. Moreover, Oriental languages are many, and young men in banks and firms abroad are changed frequently from place to place—now in Calcutta, later in Burmah, or the change may be to Siam, China, Japan, Malay States, Manila, and to places and districts in these countries where dialects are spoken which require a separate study altogether. The firm may not know in what country, of the many they are interested in, a vacancy may crop up and the clerk will not know which language to study. All these are difficulties which have to be met if our young men are to be equipped as they should be; in course of time they will no doubt, be overcome; necessity will demand it unless the British merchant consents to allow himself and his country's trade to disappear from the world's markets.

Notes and News.

USE OF THE HYPODERMIC SYRINGE IN THE ADMINISTRATION OF DRUGS.

DR. J. TERTIUS CLARKE'S letter addressed to the Editor on this subject, which was published in the September 1 number of this Journal, is a valuable contribution to the use of quinine when given by intramuscular injection, and we do not regret having published the statements made, seeing we have drawn forth a reply from so well-known an authority as Dr. J. Tertius Clarke.

The occurrence of tetanus did not occur to us as a prominently dangerous feature of administering quinine by intramuscular injection, but it was rather to the uncertainty of absorption, and especially to the local and general disturbances created, that we referred. Experiences of different individuals vary evidently on this subject, and each individual can only go by his own results. Moreover, the references to the dangers and inconvenience of intramuscular injections to which Dr. Clarke takes exception were not made anent giving quinine intramuscularly in desperate cases, for that would be removing a method of treatment which has, in most people's hands having any experience of the matter, had beneficial effects well-nigh miraculous in their action. Not to inject quinine hypodermically, intramuscularly, or intravenously when febrile attacks are otherwise uncontrollable is to bring a serious accusation against the medical man who neglects so potent a remedy. The writer of the article referred to had evidently in his mind the present-day practice of so many doctors, especially those who have had a Continental training, of using the hypodermic syringe on every possible occasion. It has come to this, that many medical men look upon a colleague who gives quinine by the mouth as old fashioned, or, in other words, that he is not doing his duty by his patient; and as with quinine so with other drugs. The doctor is tending to become more a skilled mechanic with his "each disease its own drug" theory, and that administered by what has been termed an "unnatural channel." To many the evil consequences of quinine, antimony, salvarsan, &c., given hypodermically is a regrettable memory; not from tetanus but from the local troubles engendered: abscess, sloughing, necrosis of bone, fistulous tracts lasting for a year or more or until dealt with, chronic blood poisoning, hectic and death traceable directly to the use of the hypodermic injections of one or other of these drugs.

We thank Dr. Clarke for his letter, and feel that men who have had unfortunate experiences with the administration of drugs by the hypodermic needle may console themselves that, although they have to lament the death of a patient in consequence of following this method, mankind generally has benefited; and as it is, after all, the greatest good to the greatest number that counts, so the drawbacks had better be "censored" and the syringe allowed to hold its sway.

Correspondence.

INTRAMUSCULAR INJECTIONS OF QUININE.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—The case against intramuscular or subcutaneous injections of quinine may be summarized as follows: The behaviour of quinine administered in this manner, and also by the mouth, has now been carefully studied by a very large number of thoroughly capable observers, especially more recently, by Kleine, Jacoangeli, Mariani, Modigliana, Giemsa, Schaumann, Gaglio, Schmitz, Megaw, MacGilchrist, and others.

It has been clearly shown that *in vitro* a large amount of quinine is precipitated in the presence of various albumins, especially when the solution of quinine is a strong one.

Mariani injected a 1 in 5 solution into the leg of a rabbit. When this was killed seventeen hours later 66·5 per cent. of the quinine was still present at the site of injection.

By very numerous and complete quantitative estimations of the quinine eliminated in the urine after both injection and oral administration, it has been clearly shown that the absorption by the mouth is much more rapid and also greater in total quantity than absorption from subcutaneous and intramuscular injections.

From a consideration of these facts, it is difficult to imagine what theoretical advantage injection can have over oral administration, at least in ordinary cases. True, if the injected quinine is in very weak dilution more of it is absorbed, but this necessitates the injection of large quantities of fluid. Moreover injections often give rise to considerable local trouble and occasionally to severe local inflammation and even to tetanus.

It has, however, been suggested by D. Sandro that, by injecting quinine, absorption through the liver is avoided; but this does not prove much, because we have no reason for supposing that the drug is destroyed in its passage through that organ. In fact centuries of administration by the mouth, as well as the numerous estimations of quinine in the urine, show that quinine remains effective in spite of such passage.

A priori, therefore, there appears to be no case at all for preferring injections to oral administration, except in rare cases where, owing to gastro-intestinal troubles, oral absorption is much prevented or delayed; and in patients who cannot or will not take quinine by the mouth; and perhaps for prophylactic use where it is advisable to establish a "quinine depot" in the body for the purpose of giving a continual supply of the drug to the blood in persons who will not take it by the mouth.

The only plea in favour of the injections is that given by several observers who maintain that their clinical experience proves the injections to be superior. But anyone who has considered the extreme difficulty of obtaining clear proof by such clinical evidence will, to be frank, doubt such conclusions in face of the strong *a priori* case against the injections. For instance, Dr. Tertius Clark says in your current issue* that he and many others have seen "temperatures come down after intramuscular injection which had not been touched by quinine by the mouth, and this not merely in a few cases but very many times." Now the salient peculiarity of malarial fever is that it "comes down" by itself, while mere rest in bed and good food will, especially as proved by Caccini, tend to ameliorate the fever by themselves. The malaria chart is so discontinuous and interrupted that the longest and most careful researches are required before it can be established that benefit is in any way caused by treatment. The only evidence which would be passed by statisticians as amounting to proof would lie in counting the parasites before and after treatment in a very large number of cases. On the other hand, the statements that are made by some clinicians upon this point belong to the class of unproved opinions, and I doubt whether in a single case any clinician has ever made out a good statistical and scientific proof of the theorem that injections are in any way better than, or as good as, oral administration—at least in ordinary cases.

The *a priori* objections are so strong that clinicians who wish to establish the utility of injections must be asked to prove their case, not by *obiter dicta*, but by very careful statistical evidence. In the meantime therefore I, for one, fail to see that they have even established a *prima facie* case in favour of the contention. And our doubts are increased when we observe that such writers often appear not to have studied the literature thoroughly.

They must establish not only that injections may be useful, but that they are of superior efficacy to oral administration. Injections cause much destruction of tissue, and MacGilchrist has shown that such destruction occurs even when the solution is as weak as 1 in 150. Unless, therefore, there is some very great advantage in the injections over oral administration, the former can scarcely be properly utilized, except in certain special cases; and the advocates of injection must prove that they possess such great advantages, which they have certainly not done up to the present. The final test for effectiveness in any line of treatment of malaria is that it shall completely extirpate the parasitic invasion. Do injections attain this end more quickly than oral administration? No proof of this has yet been given.

While writing this letter, I have two cases under treatment which have been subjected to injections of quinine without effecting anything like permanent cure. One of these tells me that he was given altogether fourteen injections distributed over three weeks, but that three days after the last injection he suffered from what he described as the worst attack he had ever had. This was a fortnight ago, and he still has a large tumour about three inches in diameter on his hip, where the injections were made, and informs me that the inflammation formerly spread all up one flank. Some time ago I saw a child in a Greek hospital, who was so covered with painful lumps caused by innumerable injections that she shrieked whenever she saw a doctor, and I judged that the fever from which she still continued to suffer was probably due rather to the injections than to her malaria.

I do not deny that injections may be called for in a few special cases, or that they may be of some utility when quinine cannot be otherwise given; but I think that in view of the slow absorption from injections and the necrosis caused by them, they are not likely to be nearly so effective as oral administration, and should not be used as a routine measure.

* September 1, 1914.

It is, however, quite possible that some improvement might be made by which injections may be rendered more effective and less damaging to the tissues; but in the meantime I am inclined to agree entirely with MacGilchrist when he says that "quinine and its salts are fundamentally unsuited for hypodermic use. This mode of quinine administration should, therefore, be abandoned."

Yours faithfully,
RONALD ROSS.

Personal Notes.

INDIA OFFICE.

From June 16 to July 28, 1914.

Arrivals Reported in London.—Lieutenant-Colonel V. G. Drake-Brockman, I.M.S.; Colonel J. Crimmin, I.M.S.; Major T. B. Kelly, I.M.S.; Colonel A. O. Evans, I.M.S.; Lieutenant-Colonel R. J. Macnamara, I.M.S.; Major C. B. Harrison, I.M.S.; Captain G. F. Graham, I.M.S.; Captain R. S. Townsend, I.M.S.; Major C. S. Lowson, I.M.S.; Lieutenant-Colonel H. B. Melville, I.M.S.; Lieutenant-Colonel A. W. Dawson, I.M.S.; Lieutenant-Colonel A. Coleman, I.M.S.; Lieutenant E. J. Greson, I.S.M.D.

Extensions of Leave.—Major C. W. F. Melville, I.M.S., to August 31, 1914; Major A. Murphy, I.M.S., 4 m., M.C.; Captain A. N. Thomas, I.M.S., 3 m., M.C.; Major Lethbridge, I.M.S., 1 m., M.C.; Captain M. F. White, I.M.S., to November 30, 1914; Major H. R. Dutton, I.M.S., 1 m., M.C.; Major E. J. O'Meara, I.M.S., 3 m., M.C; Captain R. Kelsall, I.M.S., 6 m.; Captain A. T. Pridham, I.M.S., 6 m., M.C.; Captain A. A. McNeight, I.M.S., 1 m., M.C.; Captain C. L. Dunn, I.M.S., 3 m., M.C.; Major E. J. Morgan, I.M.S., 6 m., M.C.

Permitted to Return.—Major H. R. Dutton, I.M.S.; Lieutenant-Colonel J. Penny, I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Abbott, Major S. H. L., I.M.S., Punjab, 24 m., April 23, 1914.
Anthony, Major R. W., I.M.S., Bombay, 8 m., March 31, 1914.
Bird, Lieutenant-Colonel R., I.M.S., Bl., 6 m., April 14, 1914.
Birdwood, Lieutenant-Colonel G. T., I.M.S., Und. Prov., 7 m., March 30, 1914.
Castor, Lieutenant-Colonel R. H., I.M.S., Burma, 24 m., November 26, 1912.
Christian, Captain J. B., I.M.S., Bo., 21 m., January 15, 1913.
Clemesha, Major W. W., I.M.S., Punjab.
Cox, Major W. H., D.S.O., I.M.S., Burma, 18 m., April 12, 1913.
Crump, Captain S. T., I.M.S., Burma Medl., 6 m. 10 d., April 9, 1913.
Dalziel, Major R. M., I.M.S., Punj., 12 m., December 10, 1913.
Delany, Major T. H., I.M.S., Behar and Orissa, 13 m., November 11, 1913.
Drake, Captain H. B., I.M.S., Bo. Mint., 6 m., May 2, 1914.
Drake-Brockman, Lieutenant-Colonel H. E., I.M.S., 6 m., April 18, 1914.
Drake-Brockman, Lieutenant-Colonel V. G., I.M.S., India Foreign Depart., 7 m. 24 d., May 1, 1914.
Dunn, Captain C. L., I.M.S., U.P. Sanitary Comm., 11 m., November 4, 1913.
Dutton, Major H. R., I.M.S., Delhi, 16 m. 20 d., June 3, 1913.
Evans, Colonel A. V., I.M.S., Burma Hospitals.
Fayrer, Major F. D. S., I.M.S., 16 m. 27 d., September 25, 1913.
Finlayson, Captain W. T., I.M.S., Punjab, 24 m., October 24, 1912.
Forster, Major W. H. C., I.M.S., 24 m., October 10, 1913.
Gloster, Major T. H., I.M.S., Bo., Bacteriological Dept., 12 m., June 13, 1914.
Haig, Lieutenant-Colonel P. B., I.M.S., 24 m., October 24, 1914.
Harvey, Major W. F., I.M.S., India Misc., Dir. Central Research Inst., Kasauli, 24 m., February 5, 1914.
Hayward, Major W. D., I.M.S., M., 15 m., March 27, 1914.
Hojel, Lieutenant-Colonel J. G., I.M.S., Bo. Med. Dept., 12 m., November 16, 1913.
Hulbert, Lieutenant-Colonel J. G., I.M.S., U.P., 6 m., November 12, 1913.
Hunter, Lieutenant-Colonel G. Y. C., I.M.S., B.Gaols, 42 m. 26 d., March 30, 1911.
Hutchinson, Major L. T. R., I.M.S., Bo., 12 m., November 15, 1913.
Innes, Major H., I.M.S., Assam., 21 m., February 18, 1914.
James, Major S. P., I.M.S., India Sanitary and Medl., 9 m. 10 d., January 23, 1914.
King, Major G., I.M.S., Behar and Orissa, 14 m., February 18, 1914.
Knapton, Major H. A. F., I.M.S., Bo. Sanitary Comm., 12 m., October 15, 1913.
Knox, Major R. W., I.M.S., Indian Foreign Dept., 14 m., August 30, 1913.
Lethbridge, Major W., I.M.S., Rajpootana, 23 m. 2 d., October 13, 1913.
Lowson, Major C. S., I.M.S., Bombay Jails.
Macnamara, Lieutenant-Colonel R. J., I.M.S., Ms. Prisons, 9 m., May 17, 1914.
Maconachie, Captain G. W., I.M.S., Mc. Prisons, 9 m. 29 d., March 25, 1914.
Macrae, Captain I. M., I.M.S., Agra Cent. Prison, 18 m., March 1, 1914.
Manifold, Colonel C. C., I.M.S., U.P., 6 m. 20 d., March 29, 1914.
McCay, Major D., I.M.S., B. Med., 14 m., September 1, 1913.
McDonald, Major J. H., I.M.S., Bo., 20 m., March 19, 1913.
Morgan, Major E. J., I.M.S., U.P., 12 m., October 1, 1913.
Newman, Lieutenant-Colonel E. A. R., I.M.S., Bl. Emign. Dept., 7 m. 15 d., May 15, 1914.
Nutt, Major H. R., I.M.S., U.P., 8 m., March 31, 1914.
O'Meara, Major E. J., I.M.S., Und. Prov.
O'Neill, Major P. L., I.M.S., M., 18 m., March 23, 1913.
Peebles, Captain A. S. M., I.M.S. Bl., 15 m., March 31, 1914.
Penny, Lieutenant-Colonel J., I.M.S., Burma, 21 m., December 25, 1912.
Prall, Lieutenant-Colonel S. E., I.M.S., Bo. Med., 12 m., February 18, 1914.
Rainier, Major N. R. J., I.M.S., Cent. Prov., 23 m. 29 d., October 9, 1913.
Ross, Captain H., I.M.S., U.P., 24 m., November 20, 1912.
Saigol, Captain R. D., I.M.S., Burma, 24 m., February 10, 1913.
Salisbury, Captain F. H., I.M.S., B. Gaols, 13 m., October 20, 1913.
Scott-Moncrieff, Major W. E., I.M.S., N.-W.F. Prov., 32 m. 7 d., November 19, 1911.
Seton, Brevet-Colonel B. G., I.M.S., 9 m., March 2, 1914.
Shaw, Captain W. S. J., I.M.S., Bo., 15 m., November 8, 1913.
Smith, Lieutenant-Colonel S. B., I.M.S., Punjab, 18 m., April 29, 1914.
Stevenson, Captain W. D. H., I.M.S., Bo. Bacteriological Laboratory, 13 m., October 4, 1913.
Thompson, Major F. S. C., I.M.S., B. Gaols, 24 m., November 15, 1913.
Townsend, Captain R. S., I.M.S.
Vaughan, Lieutenant-Colonel J. C. S., I.M.S., Behar and Orissa.
Walker, Major J. N., I.M.S., U.P., 12 m., October 30, 1913.

COLONIAL MEDICAL SERVICE.

Dr. T. Hood has assumed duty on appointment as Director of Medical and Sanitary Services, Nigeria.

Leave of absence granted to Dr. Macphail, Medical Officer, No. 1 District, St. Lucia, has been extended for one month.

The post of Government Veterinary Surgeon of British Guiana has been filled by the appointment of Mr. A. S. Milne, M.R.C.V.S.

Original Communications.

THE SYSTEMIC POSITION OF THE GENUS *TRICOPHYTON* MALMSTEN 1845.

By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.,
Director, Wellcome Tropical Research Laboratories,
AND
ALEXANDER MARSHALL,
Senior Bacteriological Laboratory Assistant, Khartoum.

Introductory.—As a rule no mention of the genus *Tricophyton* is to be found in the larger works on Fungi, or if it is found it is used only as a synonym. Thus Saccardo, in vol. xviii of his "Sylloge Fungorum," has an *Index Universalis Cohortium, Familiarum, Subfamiliarum, Generum, Subgenerum, atque Synonymorum præcipuorum in toto opere* (vol. i, xviii) *expositorum*, in which, on p. 833, is printed:—

Tricophyton Malmst = Sporotrichum Link.

When so great an authority as Saccardo publishes a statement of this nature in the year 1906, no further excuse is necessary for bringing forward any facts which may elucidate the systemic position of Malmsten's genus *Trichophyton*.

Historical.—In 1844 Gruby discovered the parasite of ringworm, and this was verified in 1845 by Malmsten, who proposed two generic names for the new fungus, *i.e.*, "Trichophyton" or "Trichomyces," and one specific name "Tonsurans." The first generic name has become established and the genus, the systemic position of which we are about to review, is now known as *Trichophyton* Malmsten 1845; very often the date given is 1848, which is that of the publication of the German translation and not the date of the original Swedish work, the name being derived from θρίξ, hair, and φυτόν, a plant.

Malmsten believed the genus *Trichophyton* to be closely related to the genus *Torula* Persoon 1801, and especially to the species *T. olivacea* Corda 1837 and *T. abbreviata* Corda 1837.

This relationship was adopted by Charles Robin in his celebrated work "Histoire Naturelle des Végétaux Parasites," published in 1853. His classification is as follows: Fungi: Division, *Arthrosporei*; Tribe, *Torulacei*; Genus, *Trichophyton* Malmsten.

We have been unable to refer to Malmsten's original paper, but it is not difficult to understand the reason why, in 1845, he believed *Trichophyton* to be allied to *Torula* Persoon 1801.

In 1886 Hallier regarded the relationship to be closely allied to the genus *Penicillium* Link 1809.

In 1875 Grawitz made a new assertion, claiming that the relationship was with *Oospora* Wallroth 1833, a view which was adopted by Baumgarten in his "Pathologischen Mykologie" in 1890.

Later researches by Duclaux in 1886, by Verujsky in 1887, and still later by Sabouraud, indicated that some of the species should be classified near to *Sporotrichum* Link 1809, which suggestion has been adopted by Saccardo in his "Sylloge Fungorum," though he goes further, making *Trichophyton* merely a synonym of *Sporotrichum*.

Bodin (1899-1902) brought forward views tending to show that the relationship is complex, some of the species being allied to *Endoconidium* Prillieux and Delacroix 1891 (a genus which lately disappeared, having become *Stromatinia* Prillieux 1897) while other species were held to be more closely related to *Acladium* Link 1809 and to *Haplaria* Link 1809. These views are based upon a study of the sporulation and indicate that *Trichophyton* is a genus belonging to Fuckel's Class *Fungi Imperfecti*, and, adopting the older methods of classification, to the Subclass *Hyphomyceteæ* Martius 1817, the Family *Mucedinaceæ* Link 1809, Subfamily *Amerosporeæ* Saccardo 1886, Tribe *Macronemæ* Saccardo 1886, and Subtribe *Botrytidæ* Saccardo 1886.

Vuillemin's recent classification places the genus under the Order *Thallosporales*, Suborder *Arthrosporales* Vuillemin 1910, and allies it with *Mycoderma* Persoon 1822, *Madurella* Brumpt 1905, *Indiella* Brumpt 1906, *Epidermophyton* Lang 1879, *Microsporum* Gruby 1843, *Achorion* Remak 1845, and *Trichosporum* Behrend 1890.

In June, 1899, Matruchot and Dassonville published a paper entitled "Sur la position systematique des Trichophytons" and followed it later in the same year by another paper entitled "Sur le *Ctenomyces Serratus* (Eidam) comparé aux Champignons des teignes." Briefly stated, their view is that the genus *Trichophyton* Malmsten 1845, belongs to the *Ascomycetes* of De Bary if this is taken to include *Hemiascomycetes* of Brefeld. In either case, whether these classifications or Schröter's more detailed arrangement of the Ascomycetes be adopted, does not concern our present purpose as both contain the family Gymnoascaceæ (often written Gymnoasceæ) in which Matruchot and Dassonville place the genus *Trichophyton*.

Their reasons for this classification are:

(1) *Ctenomyces serratus* Eidam 1880 is a fungus found on the feathers of birds which, when cultivated on Sabouraud's proof media, produces growths strikingly analogous to those of species of Trichophyton.

(2) *Ctenomyces serratus*, when inoculated into animals, gives rise to lesions resembling a *Trichophyton* eruption in which it appears in a filamentous form.

(3) A fungus closely resembling a Ctenomyces, which they found in a ringworm in a dog, when cultivated gave rise to perithecia. For this fungus they created a new genus *Eidamella* Matruchot and Dassonville 1901, calling the given species *Eidamella spinosa* Matruchot and Dassonville 1901.

Against this view Sabouraud has pointed out that in the cultures of this fungus they found intercalary chlamydospores, but neither fusiform bodies nor the conidia usually seen in Trichophyton cultures, and therefore he considers their demonstration to be still incomplete.

To summarize, Matruchot and Dassonville have brought forward considerable evidence to support the view that the genus *Trichophyton* Malmsten 1845 belongs to the family *Gymnoascaceæ* Baranetzky 1872 of the Ascomycetes, but as so great an authority as

Sabouraud does not accept their proofs as final there is obviously an opening for further observations, especially as no proof of such a classification has, up to the present, been brought forward with regard to a Trichophyton obtained from man.

Trichophyton currii.—In a previous paper published during the present year in this Journal we have given an account of a Trichophyton Endothrix which we found to be the common ringworm on the heads of schoolboys in Khartoum and Omdurman and to which we gave the name *Trichophyton currii* Chalmers and Marshall 1914.

In this paper we gave photographs of the parasite, its cultures and the disease which it produced, and therefore do not consider it necessary to repeat that which we have so recently written and depicted, except to state that in liquid media the conidia are formed in masses.

It will be seen by reference to our previous paper that the growth formed by *T. currii* on Sabouraud's maltose agar is white, but if the culture is kept for several months it gradually becomes black.

If the growth produced at atmospheric temperature (average about 100° F.) in one of Kitasato's flasks, *i.e.*, in a thin layer of the medium, is examined posteriorly a number of small black dots may be seen. These dots resemble in size the head of a fine entomological pin, that is to say about 0·5 mm. on the average (*vide* fig. 1) although some few appear to be larger.

When a small one is separated out and examined, it shows the appearance depicted in fig. 2, where it will be seen to be a rounded body composed of interlocked hyphæ with thickened greenish-black walls.

On section the structure shows the appearance depicted in figs. 3 and 4, on examination of which it will be noted that there is an outer wall composed of the interlocked hyphæ mentioned above, while the contents show hyphæ and cells the spaces between which are filled, in the fresh condition, with a fatty material.

If a black dot is teased or broken and examined in a fresh state it will be observed how easily the outer wall is separated into its component hyphæ and also that the contents are simply fatty material and ovoidal bodies (*vide* fig. 5) composed of a double contoured wall and clear hyaline cytoplasm.

The black dots appeared first when the cultures were about two months old, a length of time probably equal to a year's growth at atmospheric temperature in Europe, but at the time of writing they are nearly seven months old and consist of only the outer wall, the contents having all disappeared.

When they, in their younger condition, with some of the surrounding hyphæ were planted on Sabouraud's or other media, typical trichophytic growths were produced apparently indistinguishable from those originally obtained from the hair. Inoculated into animals they gave no better results than that produced by inoculations direct from a patient's head or from fresh cultures.

Such in brief is the description of the bodies the nature of which we are now about to discuss.

Discussion.—The structure and appearance of the black dots confirm us in the view that they are *Perithecia.* Further, the fact that they are simply composed of interlocked hyphæ indicates that the fungus giving rise to them belongs to the Hemiascomycetes and to the family Gymnoascaceæ Baranetzky 1872.

Their origin appears to us to be simply thickened hyphæ wrapped around other hyphæ which break up into fatty bodies and the ovoidal bodies mentioned above. These ovoidal bodies are, in our opinion, asci which have failed to produce ascospores, nor is the reason of this difficult to understand, as it is simply a stage of the adaptation from the saphrophytic, or the parasitic, existence on a plant to the more perfect parasitic condition on a man.

Classification.—If we are right in our conclusions given above then *T. currii* would belong to Baranetzky's family Gymnoascaceæ which already contains the genera:—

Amauroascus Schröter 1893.
Arachniotus Schröter 1893.
Ctenomyces Eidam 1880.
Eidamella Matruchot and Dassonville 1901.
Gymnoascus Baranetzky 1872.
Myxotrichum Kunze 1823.

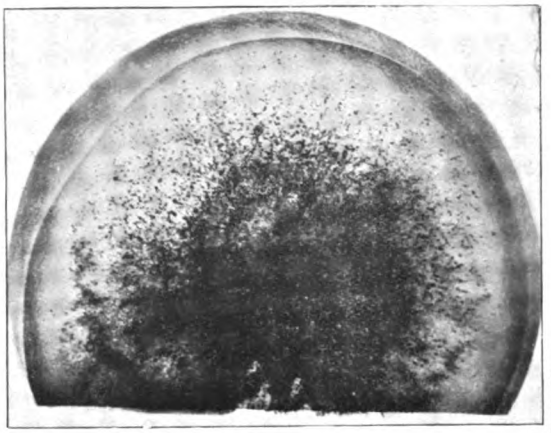
Moreover, our observations and deductions remarkably agree with, confirm and support the admirable researches of Matruchot and Dassonville with whom we are in entire concord.

Evolution.—We are further of the opinion that *Eidamella spinosa* of Matruchot and Dassonville 1901, indicates the least specialized form of Trichophyton known, in that it develops ascospores in the asci. *Trichophyton currii* appears to us to have advanced a step further along the line of parasitic adaptation in that it has ceased to develop the ascospores, and, moreover, has begun to develop fusiform bodies and spiral loops.

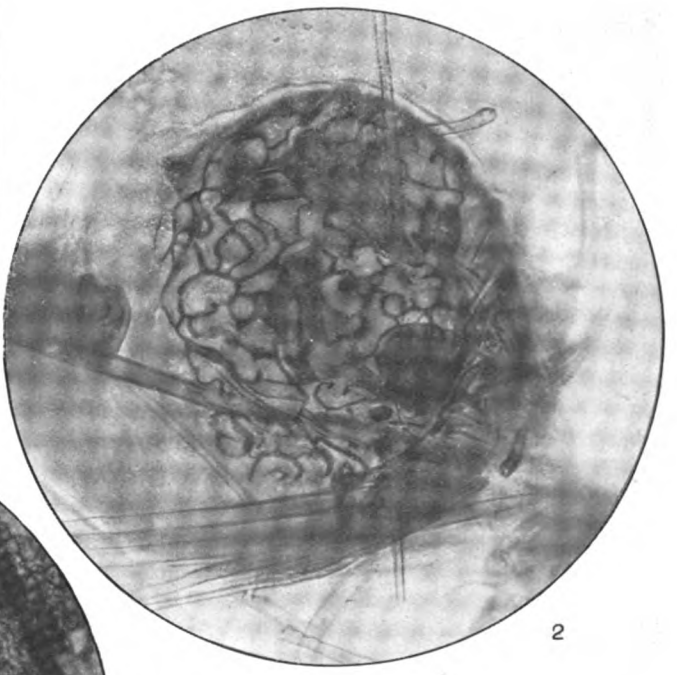
In the evolutionary tree depicted in our previous paper we indicated that *T. currii* was closely related to the main stem of the Trichophytons, and this was one of the reasons of our doing so, though we did not mention it in that paper. Moreover, in the same paper we gave reasons for considering that *T. currii* was closely related to a possible parental form of the Crateriform and the Acuminate groups of the Endothrix division of the genus *Trichophyton.*

In our opinion a step further in parasitic existence is indicated by the appearance in the cultures of *T. currii* of a very few spindle-shaped bodies and a few spirals. In our opinion the spirals indicate an attempt to form a perithecium. In this view we differ from other observers who consider them to represent merely ornaments on the outside of the perithecium. Our contrary opinion is based on the fact that the perithecia of *T. currii* do not show ornamentation, and we therefore consider the spiral bodies to represent not merely the ornamentation but the whole wall of the perithecium.

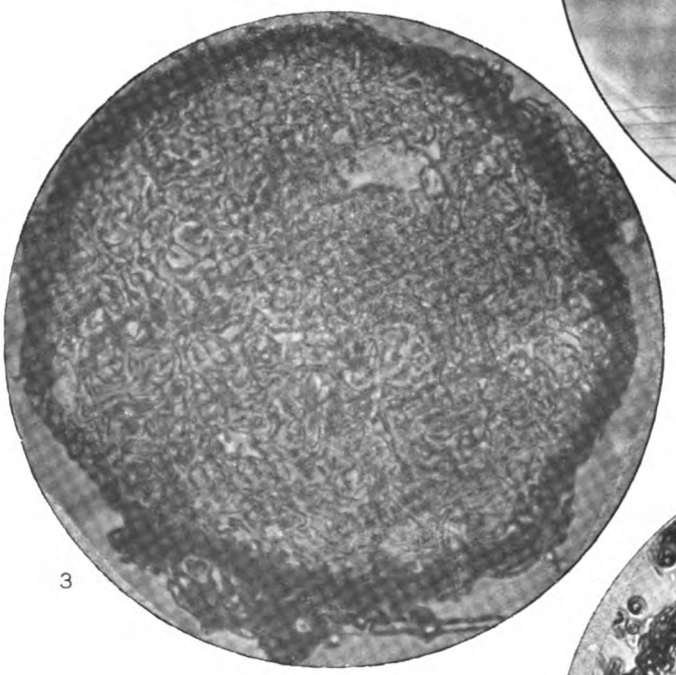
With regard to the septate spindle bodies we are not in a position to make any definite statement, though we incline rather to the view that they represent



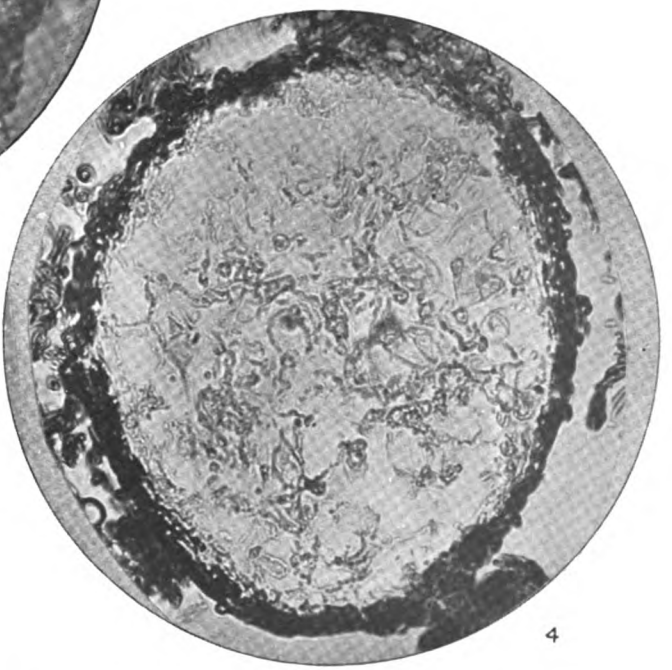
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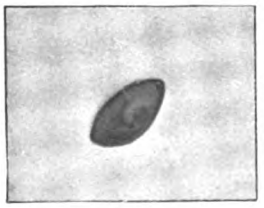
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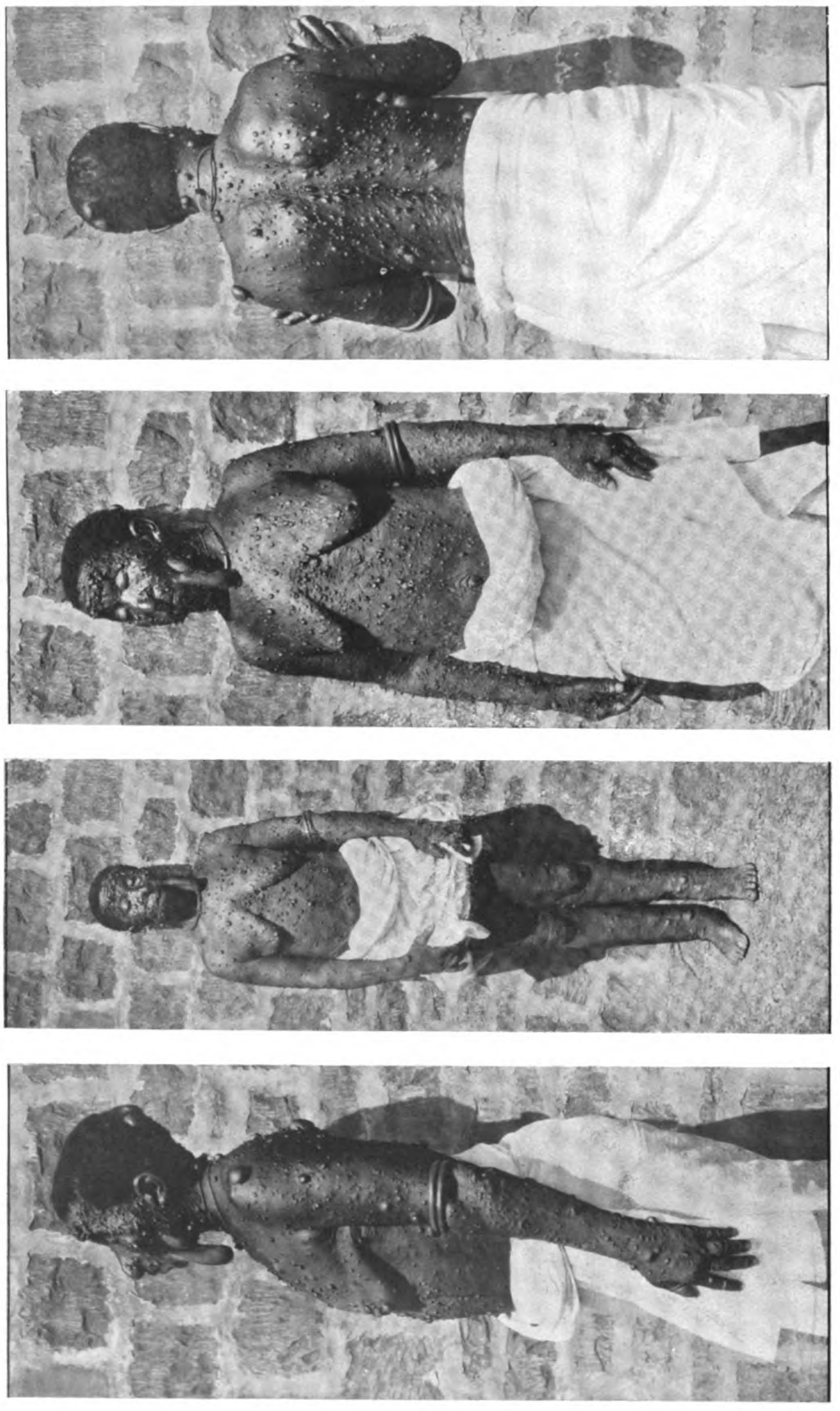
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5

To illustrate article, "The Systemic Position of the Genus *Trichophyton* Malmsten 1845," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and ALEXANDER MARSHALL.





To illustrate article, "Molluscum Fibrosum, Pendulatum atque Elephantiacum," by Dr. F. S. HARPER.

an attempt to form asci than that they are related to the chlamydospores.

If we are right in our opinions then some of the peculiar features of *Trichophyton* morphology are explicable.

Conclusion.—We believe that the genus *Trichophyton* Malmsten 1845 belongs to the family *Gymnoascaceæ* Baranetzky 1872 which is included in either Brefeld's *Hemiascomycetes* or De Bary's *Ascomycetes*, according to the form of classification adopted by the reader.

Khartoum,
July 18, 1914.

List of Illustrations.

These illustrations are much improved if examined by means of a lens.

Fig. 1.—Photograph of a culture of *Trichophyton currii* Chalmers and Marshall 1914, about seven months old, on Sabouraud's maltose agar in one of Kitasato's flasks and taken from the back. Note the small black dots. Fresh preparation. Natural size.

Fig. 2.—Photomicrograph of one of the small black dots as seen in fig. 1, but taken from a culture when only two months old. Surface view of a fresh preparation. × 1,300 diameters.

Fig 3.—Photomicrograph of a section of one of the small black dots as depicted in fig. 1, but taken from a culture about four months old and preserved so as to show the fat bodies *in situ*. Unstained. × 1,570 diameters.

Fig 4.—Photomicrograph of a section of one of the small black dots shown in fig. 1, but with the fat dissolved out of the specimen. Stained by the Oxford method. × 800 diameters.

Fig. 5.—Photomicrograph of one of the ovoidal bodies obtained by teasing out the contents of a black dot and staining by the Oxford method. × 1,140 diameters.

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Arranged in alphabetical order.

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MOLLUSCUM FIBROSUM, PENDULATUM ATQUE ELEPHANTIACUM.

A Short Account of a Case.

By Dr. F. S. Harper.

West African Medical Staff, Tamale, Northern Territories, Gold Coast, West Africa.

Patient, Falimata, female Dagomba, aged about 40, has lived for six years in a village near here. She was born in Yendi on the German boundary and came to reside here six years ago. She had no brothers but two sisters, who grew up and were married, but who have had no children. Patient herself has had four children of whom three, all girls, died within a year of their birth. The fourth, a male, is alive and healthy and shows no signs of the disease. She says that she was born with the disease, but my opinion is that it probably came on just about the time when she could begin to remember; in any case her memory does not carry her far enough back to the time when she was without it. Her mother and father both stayed at Yendi and died there. She is positive her mother had the same sickness; she does not remember her having seen anybody else with the same sickness except her mother. It is interesting that, according to patient's history, her mother presented the same three types of the disease as patient herself, even to the pendulous tumour (see photograph) which was on the same spot on the same side of the face, viz., the left.

Patient does not think that the disease has progressed since her childhood, she says that the pendulous tumour was long when she was a girl.

It is interesting that the left side of the face, trunk, and legs show more marked manifestations of the disease—*e.g.*, there is a large tumour on the left knee-joint over the quadriceps tendon, and the left leg is more elephantiasic in type than the right, also patient cannot see out of her left eye. She is perfectly healthy otherwise. Neither of her female children showed any signs of the disease when born.

The excellent photographs were very kindly taken for me by Dr. J. J. Simpson, of the Entomological Research Society.

LONDON SCHOOL OF TROPICAL MEDICINE.

The "Duncan Medal," awarded to the student who obtains the greatest aggregate of marks during the Session, has been gained by Captain A. C. Munro, I.M.S., in respect of the Forty-sixth Session, May to July, 1914.

Captain Munro has also gained the Medal in recognition of having attained the greatest aggregate of marks during the medical year 1913-14.

Professor Perrot, of Saigon, has succeeded in producing fibre suitable for making ropes, twine, coarse thread, bags, &c., from the stalk of the water hyacinth, so well known in China. As a substitute for jute the fibre of this plant possesses certain advantages.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 1, 1914.

THE DISEASE AFTER-MATH OF WAR.

THE threat of cholera amongst the armies on the Russo-Austrian frontier is causing some disquietude in Europe, and naturally so. In a normal state of affairs, however, it is a neighbourhood where a few cases of Asiatic cholera occur well-nigh every year, but during recent times nothing further develops. At the present moment, however, with an army moving about from place to place, a few cases of cholera may infect many water supplies, and in place of a few sporadic cases an epidemic may break out. The disease is reported chiefly amongst the defeated Austrian armies, but as they retreat the Russians advancing over the ground evacuated may speedily become infected. A force retreating before its pursuers cannot follow even the rudiments of sanitation, with the consequence that not only are the soldiers themselves exposed to disease, but they leave behind amongst those following them and amongst the civil population a condition of things which is calculated to generate and to spread disease. The soldiers of a retreating army seek shelter in and around the farm-houses of the district they are passing through, and in Galicia the sanitary arrangements of these dwellings are at the best of times primitive. A single case of cholera defecating on the ground near the house may pollute the well, and a focus of infection is thereby set up which becomes a danger to all and sundry. In well appointed camps a soldier who goes several times to the latrine in twenty-four hours is reported to the medical officer, and precautionary steps are taken to isolate him, to disinfect all his stools and to watch his symptoms closely; in the confusion of a routed army all these routine precautions are impossible and disease is allowed to spread uncontrolled. The danger, therefore, of cholera spreading, once it breaks out in even a limited area, is so great that it is natural that alarm is taken, and as a means of prevention it is urgent that the alarm be sounded far and wide. Nor will the danger diminish with the advent of wet weather, for then the surface water finds its way into the unprotected well situated, all too frequently, in the compound of the farm dwellings and near by the midden where the cholera stools may have been deposited, either by the patient stooling there or by the evacuations passed in the house being thrown out on the ground adjacent to the dwelling-house.

Even in the depth of winter when snow lies all over the country the cholera germ may remain active. In Southern Russia cholera not infrequently continues through the winter months. The belief that frost and snow curtails the continuance of cholera is not true. The hygiene of a Russian farm-house, bad as it is in the light of Western town-experienced sanitarians, is rendered rather worse than better in the winter. Huddled together in the one room where the stove is kept going, infection is easily spread; but in the case of cholera it is not so much the household conditions as the water supply that is the channel of transmission. Fæcal evacuations are as a general rule thrown out around the house on the top of the snow, where they lie until the spring or until they are buried by a fresh covering of snow. But with wells frozen and buried in a snow drift the people take their water not from the well, which may be inaccessible, but by gathering the snow near by the house and melting it. As the evacuations are as a rule thrown out in a haphazard way around the house there is a danger that the stools of the cholera infected may be collected in the snow used from melting for drinking water. In this way cholera and other diseases, especially typhoid and dysentery, may be spread, to the danger of the immediate household, and also to neighbours who come to visit.

What can be done to prevent cholera spreading? In Austria at the present moment where disaster prevails, when, with the Cossacks on their track,

people are fleeing from their homes, when food is scarce and shelter from the elements impossible, little can be done to check the disease. It therefore lies with the surrounding countries to take all possible precautions. At the present moment the autumn sun is hot, flies abound, and owing to the cold nights the flies seek shelter in the warmth of the house; there is therefore a danger beyond mere water contamination. Soon, however, the flies will disappear, but the water pollution remains. When those precautions can be taken around Galicia where cholera is reported it is difficult to state, for Russia, Servia, Germany and and Austria are all at war, and precautions which might be taken in times of peace are set at nought in times of war. The rumour, therefore, of cholera in the Austrian Army is enough to cause alarm, for the chances of the spread of the disease are many.

The alarm, it is to be hoped, will not eventuate in an epidemic and there are several experiences to justify a hopeful conclusion that it may not do so. In the recent Balkan war cholera was reported in certain places, many cases occurred, but the disease never became epidemic, although the circumstances in the Balkans favoured its development even more than that prevailing in the Carpathians. The Italians did not suffer in their Tripoli campaign, although cholera always lurks around in that part of Africa.

Another comfort may be taken that perhaps the cholera spoken of in Austria is not Asiatic cholera. Intestinal flux with sudden collapse is likely to be present amongst soldiers and civilians when meals are irregular and meagre, where water is drunk from any source however polluted, by the exhausted soldiery; when the quality of food is wretched and food from "blown" tins is all too common in the rations supplied by the Army contractor. Under these conditions intestinal flux is prevalent always, and it is to be hoped, and it is just possible, that what is pronounced as cholera is nothing of the kind; it may be a choleraic diarrhœa only, for unless the comma bacillus characteristic of Asiastic cholera has been proved to be present we may well take comfort in the hope that a true cholera outbreak need not be anticipated.

It is needless to enter into other questions; with the Belgian, French and German hordes in the western part of the campaign, and Russia where it frontiers with Austria and Germany littered with dead bodies amounting to hundreds of thousands imperfectly buried, the subsequent dangers to the troops and to the countries engaged in war are manifold.

The course of the campaign in the west especially is fraught with serious dangers from this cause; for the retreat into France and then the advance from around Paris to the German border was well-nigh over the same ground, so that it has been thickly strewn with corpses of men and horses which neither a rapidly retreating nor a rapidly advancing army has had time to bury, but merely to cover over in shallow haphazard graves. Curiously enough tetanus has not been much referred to, but the disease is not unknown in these districts and should it once appear the chances are that it will continue long after the war is over.

Typhoid has scarcely had time to declare itself, and it may be that the precautionary measures of inoculation adopted for all soldiers in Western Europe may be capable of preventing the disease gaining a serious hold.

Of other ailments pneumonia will no doubt be the chief; already it has claimed a considerable number of victims amongst Territorials encamped at home, and we are prepared to hear that as the winter advances the armies in the field will suffer also.

Abstracts.

THE DISTRIBUTION AND SPREAD OF DISEASES IN THE EAST.*

By Anton Breinl.

Director of the Australian Institute of Tropical Medicine, Townsville.

Dengue is a fever of very wide distribution in the East; it gives rise to the most diverse symptoms. The onset is sudden; the body temperature rises without any premonitory symptoms. The patient complains of severe pains in the head, in the lumbar regions, and in the bones; hence the popular name of "break-bone fever."

According to Ashburn and Craig's experiments, the hitherto unknown parasite of dengue fever is transmitted by *Culex fatigans*, the common house mosquito, which is ubiquitous throughout the Tropics, and it is due to the enormous prevalence of this particular mosquito that the disease has become so widely spread.

Dengue fever occurs throughout the East, assuming now and again a pandemic character. It has been observed in Formosa, Tropical China, the Philippines, the Dutch East Indies, New Guinea, and has invaded most of the islands of the Eastern Archipelago. According to records, it was introduced into Queensland as recently as 1894, probably much earlier, as I was informed that in 1879 a fever epidemic with hardly any mortality appeared in Townsville. Since then it has swept over the populated parts of Queensland and the northern parts of Western Australia into the Northern Territory. One attack of dengue fever confers only a transient immunity, and in consequence every now and again the whole population of the northern towns has to pay its tribute to the unwelcome guest.

The appearance of a dengue fever epidemic is always a serious matter, since it invalids the sufferer completely for about two weeks, and leaves the convalescent patient in a singularly depressed state for weeks afterwards, so that after a severe dengue epidemic the number of suicides is always above the average.

Speculations as to the origin of new epidemics are

* One of the Stewart Lectures of the University of Melbourne, 1913.

fascinating. Does the dengue fever parasite lie dormant in the mosquito, its intermediary host, for months, and even years, and suddenly become again conscious of its virility when the acquired transient immunity of the populace has passed away, or is always a fresh case of the disease introduced from outside giving rise to the new epidemic? This latter conception is more likely, since one can, as a rule, see the spread starting from one centre, from street to street, and from town to town.

Malta Fever, a far more serious complaint than dengue, has not yet been able to gain a firm foothold in the East. This fever comes on gradually with headaches, bone-aches, and lassitude. The patient is very ill for months, and often slight improvements and relapses follow each other at irregular intervals.

China is the only eastern country where cases of Malta fever have been known; but it is not improbable that in the near future some of the hitherto undescribed fevers will be diagnosed as Malta fever.

Plague and *Cholera* are bacterial diseases more or less endemic in the East.

Plague is propagated by means of infected rats, and the bacilli are transmitted to a human being by the bite of the rat fleas. According to the conclusions of the Indian Commission, the spread of plague is not so much due to the migration of rats as to the presence of infected rats on ships, and the introduction of infected fleas in merchandise. We have, therefore, in plague a disease which might at any time be introduced again into Australia.

Cholera, an epidemic disease, characterized by violent gastro-intestinal symptoms and collapse, has in all probability originated in the East. Symptoms corresponding to this disease have been described in the most ancient Indian literature, and it was recorded in Java as far back as 1629. After an epidemic in Calcutta, which lasted till 1823, cholera began to spread eastwards to Malacca, Penang, Singapore, and Manila.

The possibilities of the introduction of this scourge into Australia are very great, and its advent can only be prevented by the strictest quarantine regulations.

Dysentery, a disease of world-wide distribution, is commonly observed in the East. Amœbic dysentery, caused by a protozoon, occurs endemically throughout Japan, China, the Philippine Islands, and the Dutch East Indies. Bacillary dysentery has made its appearance in New Guinea within the last two decades, and has been responsible for a great number of deaths amongst the natives. It has been spread by dysentery carriers—natives who have apparently recovered from the disease, but harbour numberless fully virulent bacteria in their intestines. Indentured labourers who have survived an attack of dysentery, carry the infection to their village, thus causing on their return an outbreak of the epidemic. It is certainly the most important disease in New Guinea from an economic point of view.

In Northern Australia dysentery is a comparatively rare complaint. On more than one occasion, however, it has been introduced into Thursday Island by labourers recruited from New Guinea.

Another intestinal complaint peculiar to the East, and of uncertain etiology, is *Sprue* (tropical aphthae), of which disease a catarrhal inflammation of the mucous membrane of the intestinal tract is the main symptom, giving rise to chronic diarrhœa. The motions are large, of greyish colour and frothy, the patient emaciates, the skin becomes dry and dark, so that the complexion of an advanced case is of an ochre colour.

Cases are found in Japan, in China, in the Philippines, Malaya, Sumatra, Java, New Caledonia, and the Fiji Islands. In Australia the occurrence of sprue is confined to the coastal belt between Mackay and Cairns, most of the cases originating in Bowen, Ingham, and Innisfail districts. No cases, or even records of cases, have been obtained from New Guinea.

Leprosy.—Cases are seen more or less frequently in the Philippines, Dutch East Indies, and especially in New Caledonia, where it has been introduced within the last fifty years. In New Guinea lepers are met with in small numbers along the coastal districts. A number of cases were diagnosed in the Mekeo district, west of Port Moresby, and on Trobriand Island, situated off the north-east coast. On the other hand, districts west of the Vailala River, where the oil fields are situated, seem singularly free from this disease.

Leprosy is fortunately comparatively rare in Australia. Amongst the aboriginals in the far north lepers are found in small numbers, whilst now and again a case is discovered in a white man.

In New Zealand in the olden times leprosy was widely distributed.

Beriberi is perhaps of the greatest economic importance of complaints which are most probably of purely eastern origin, and have spread far and wide.

References to this disease, under the name of "Kake," occur in Chinese literature of 200 B.C., and these manuscripts contain unmistakable descriptions of beriberi. In a Chinese book written about the tenth century, the dry and wet forms of beriberi are already differentiated, and descriptions of this disease also occur in Japanese medical literature of the ninth century. Without a doubt, however, other complaints causing dropsical conditions of the legs have been confused with true beriberi.

Beriberi occupies a large and anxious share of Eastern diseases. It is prevalent in Japan, Indo-China, and China. Frequent cases occur in the Philippines, in the Malay States, and in Dutch East Indies. A number of cases have been observed among the native labourers in New Guinea, whilst numerous cases originated among the coloured crews of the pearling boats in Thursday Island, filling the hospital at certain seasons of the year to its utmost capacity. A small epidemic is said to have occurred in Western Australia, and a few cases have been described from Western Queensland, whilst quite recently this disease has appeared in some of the Pacific Islands, especially Fiji and New Caledonia.

In spite of the large amount of work done on the etiology of this disease, it is still, to a certain extent, shrouded in mystery. It is a generally accepted

opinion that the disease is due to a deficient diet, to the exclusive use of highly polished rice; in other words, rice of which the husk has been completely removed. It is very probable, however, that even at present several different, but closely allied, diseases are classed under "beriberi."

Yaws, or *Frambœsia Tropica* is another disease of very wide distribution in the eastern Tropics. Yaws is purely a tropical disease, closely resembling syphilis in its clinical manifestations. It is accompanied by an eruption, which may attack any part of the body, and is most frequently found on the hands and soles of the feet.

Yaws is very common in India, the Malay Peninsula, in Siam, Java, and in the Philippine Islands, and throughout the Pacific Islands. In Fiji every child is said to contract the disease in infancy. In China cases of yaws are only rarely encountered, and then mostly in coolies returning from the Straits Settlements.

A mild form of yaws prevails in the Torres Strait Islands, where nearly every child examined had some sign of a past or present attack.

It also occurs amongst the aboriginals of the Northern Territory, and many of the aboriginal children were infected.

In New Guinea, as far as visited, the disease is rampant. A large percentage of the children in the coastal villages suffer from yaws in the different stages, and many of the adults have the curious scar formation around the mouth, the result of a past infection. Europeans, on the whole, do not contract yaws, as this disease is only propagated by contact.

Filariasis and *Elephantiasis* in the East are of special interest as regards their distribution.

In Japan, filariasis and elephantiasis are known to occur, but it is only the most southern part of the great island which is affected by the disease. Throughout China, filariasis is common, and it was in China where Sir Patrick Manson made his discoveries on the life-history of the parasite.

Filariasis is common in the Philippine Islands, in Guam, it is present in the Malay Settlements, in the Dutch East Indies, New Guinea, Queensland, and the Northern Territory, and it is very widely distributed in most of the Pacific Islands.

It is probable that all the filariæ of the different eastern countries belong to one and the same species, although attention has been drawn lately to the fact that the typical nightly presence and daily absence of the parasites from the peripheral blood is not common to all the larvæ, but in some cases they are to be found whenever sought, day or night.

The Chinese microfilaria is a nocturnal filaria (from this peculiarity hails the name *Microfilaria nocturna*). The Philippine microfilaria, as well as the microfilaria in the blood of some of the New Guinea natives, is of the non-periodical type. The nocturnal filaria, however, was found to exist in New Guinea as well.

In some of the Pacific Islands, as, for example, Fiji, the non-periodical filaria exists, and, according to Bahr's observations, *Stegomyia pseudoscutellaris* acts as intermediary host. This same species of mosquito is prevalent in Eastern New Guinea, and it is possible that the distribution of the non-periodical filaria may be coincident with the presence or absence of this species of mosquito.

In Queensland the microfilaria show, without exception, the typical periodicity.

Filariasis is very irregularly distributed in Queensland. The disease is more prevalent in Brisbane and Port Douglas than in Townsville. In Brisbane nearly 17 per cent. of the total admissions to the hospital show the parasite in their blood; in Townsville, however, only 3·4 per cent.

Of diseases which are more or less confined only to parts of the East, *Gangosa* offers some interest. Gangosa, or "Rhinopharyngitis mutilans," is an ulcerative condition of the nose, palate, and throat, which begins as a rule as a thick œdematous swelling on the upper lip, and spreads into the nasal cavity to the pharynx, and often to the skin of the face and neck, destroying the greater part of the face and giving rise to a most hideous appearance.

Cases of Gangosa were first described as occurring in the Ladrone Islands, Caroline Islands, Guam, and later in the Philippines. It is endemic in British New Guinea, and numbers of cases have been observed in the coastal districts between the Fly River and Samarai. It has been found in the Torres Strait Islands, is most common in Murray Island, where it was referred to as far back as 1822 by Dr. Wilson in his narrative of a "Voyage Round the World."

Juxta-articular Nodules is another typical eastern disease of limited distribution. In the legs and arms, as a rule in proximity to the joints, nodules are found in the subcutaneous tissue of varying sizes, sometimes as large as hen's eggs, sometimes quite small and of hard consistency. Sir William MacGregor, when Governor of New Guinea, pointed out that the nodules occur mostly on parts which come in contact with the ground when the native is resting. The frequency of their occurrence in some of the villages, their total absence in others, however, supports the opinion of a parasitic origin, which has been confirmed lately by the discovery of a fungus in the nodules.

Agchylostomiasis is, of helminthic infections, perhaps of the greatest importance from an economic standpoint. In the tropical parts of China, the Philippines, throughout the Dutch East Indies, in British New Guinea, and in Northern Queensland, hookworm is a frequent and unwelcome guest.

Agchylostomiasis may be caused by two morphologically, but closely allied, nematode worms—*Agchylostoma duodenale* and *Necator americanus*—both of which give rise to similar clinical symptoms, namely, a profound anæmia.

The first species, *Agchylostoma duodenale*, is found in China; the second species, the American hookworm, is the more common in the Philippine Islands and in New Guinea, whilst both species are frequently encountered in Queensland.

It is very curious that Agchylostomiasis has not been found in the Australian mines, as it is well known that the damp heat in mines is especially

favourable for the development of the parasite. Experiences in other countries, such as England, Belgium, and Germany, have shown what serious consequences might arise from the employment of a few infected individuals in a suitable mine.

From this short survey of tropical diseases which occur in the eastern countries, it becomes apparent that there exists a continuity in the distribution of a great many of the diseases mentioned, from China through the Malay Peninsula and the East Indies, as far as New Guinea and tropical Australia.

Tropical Australia, on account of its insular isolation and its scanty population, has enjoyed, up to now, a freedom from the inroad of many of these diseases, although quite a number of them, such as filariasis, sprue, malaria, dengue fever, yaws and agchylostomiasis have invaded Northern Australia, and have found the conditions favourable.

Modern times, with their improved ways and means of communication, have shortened the distance between Australia and the surrounding lands, and thus have brought new and important problems before the far-seeing sanitarian.

The modern aspect of hygiene is chiefly concerned with the study of local and general conditions, which may favour the spread of disease in case it should be introduced, and at the same time with the framing and putting into practice of such quarantine regulations as will prevent their introduction.

A practical example may give a clear idea of this conception. We are now on the eve of the opening of the Panama Canal. Ships coming from zones where yellow fever is endemic can travel without leaving tropical waters to China, India, and Australia.

Stegomyia fasciata, the yellow fever carrying mosquito, has a very long life. Female mosquitoes have been kept alive in captivity in Townsville for five months, being fed twice weekly; and it is also an expert traveller, having proved its qualities by crossing from Central America to Spain and Portugal, causing outbreaks of yellow fever on shipboard, and even in Europe.

In Europe an epidemic could not spread, since stegomyia cannot live on account of the low temperature. It is quite a different matter in the East and in Northern Australia where stegomyia is very common. It occurs very frequently in Darwin, and as far south as Brisbane, and a few have been found in Newcastle. The temperature in Northern Australia, especially during the summer months, is high enough to enable the yellow fever parasite successfully to undergo its development in the mosquito. Suppose, as an instance, that infected stegomyia were introduced into North Queensland, and were able to infect one person. The diagnosis of yellow fever during the first three days is extremely difficult, even to the experienced, and it is during this time that the blood of the patient is infectious to the mosquito. Numbers of stegomyia, which occur abundantly in Queensland, would have an opportunity to take up the virus, and after twelve days, the time required for the complete development of the parasite in the mosquito, more cases of an indefinite but fatal fever would crop up, and yellow fever would soon become established.

Let us now consider the steps which may be taken to prevent such a terrible scourge as yellow fever from entering Australia. It is practically impossible to fumigate ships so thoroughly as to feel assured that all the mosquitoes have been destroyed. As an example of this, I may quote an instance which came under my own observation whilst living in South America, in a zone heavily infected with yellow fever. Several cases of yellow fever had occurred on one of the steamers, and the port authorities had undertaken the fumigation of the whole vessel. Just before the cabins were closed up, I was able to hide a wire cage containing live mosquitoes under a sheet in one of the cabins. Hours afterwards, when the ship was supposed to have been thoroughly fumigated, I inquired into the welfare of my mosquitoes, and, not altogether to my surprise, I found that the majority of the mosquitoes had passed through the ordeal unharmed.

As the fumigation of ships cannot be depended upon, there is only one course open, and that is a thorough and energetic campaign against the mosquito throughout tropical Australia.

During the yellow fever outbreak in New Orleans, the Americans have proved that a town can be made practically mosquito free within a few weeks.

But yellow fever is by no means the only danger to which Australia is exposed. Many diseases, grim and terrible in their manifestations, are to be found in countries which are within easy reach and in constant communication with Northern Australia. All the conditions which some of these diseases require in order to propagate when once they are introduced, such as climatic and suitable insect hosts, are present, with one exception, that of a dense population. Besides human diseases there are many deadly diseases in stock, which occur in the near neighbourhood of Australia, and which might be introduced any time in spite of the most thorough quarantine regulations. I refer to diseases like surra, a blood disease of horses occurring in the Philippines and India; rinderpest, and many others which would cause as much havoc and mortality as did the introduction of redwater fever, which came from the East.

Only a careful study of the conditions which favour the spread of disease, their removal if possible, and at the same time a strict and discreet quarantine service, will enable us to preserve tropical Australia from the inroad of these diseases, which might stunt its development for years to come.

PREVENTION OF MALARIA IN THE TROOPS OF OUR INDIAN EMPIRE.

By Colonel P. Hehir, I.M.S.

In most of the cases which occur in troops and followers on field service the initial infection is acquired in cantonments: the large majority are relapses. One's personal experience is that the malaria of cantonments is to a large extent bred in the human occupants and anopheline population of cantonments.

In all cantonments and barracks we should make

an inquiry into the amount of malaria present in the troops and other inhabitants, the breeding places of anophelines (especially the local malaria-bearing species), and the barracks, bazaars, and buildings which adult anopheline carriers frequent. We should use a large scale map and mark on it the extent to which malaria prevails in different barracks, bazaars, &c., and the breeding places of anophelines with the species—including all collections of surface water, streams, irrigation channels and water-courses generally, areas under wet cultivation, ponds, tanks, pools, borrow-pits, artificial collections of water (small and large), stand-pipes, &c. The terrestrial waters and possible breeding places are best seen after a heavy shower. The cantonment should be divided up into areas, the area of each unit being in charge of the medical officer of the unit, the non-regimental areas being similarly subdivided and supervised. In large cantonments when an officer with expert knowledge of malaria is available he should, under the senior medical officer, be in charge of and direct all the anti-malarial measures that are being carried out. Each of these officers should have a map of his area, and keep it up to date as regards prevalence of malaria, breeding places still in existence, breeding places removed, fresh ones that have arisen, &c.

The anti-malarial campaign in each cantonment should be planned after these preliminary inquiries have been carried out, and then systematically pushed from year to year.

The most accurate indication as to the prevalence of malaria in a cantonment is the *malarial index*. The most practicable indication is the *spleen index*, that is, the percentage of children up to 10 years of age with splenomegaly due to acute or chronic malarial infection. The spleen-rate in troops, except in highly malarial stations, is in no sense a reliable estimate as to prevalence or intensity of malarial infection—troops are usually brought under treatment and the effects of the malaria checked before the spleen attains to any great degree of enlargement.

There is a considerable amount of malaria amongst Indian children in cantonments. Of 3,884 children in various cantonments examined a few years ago on the plains in India, in the 7th (Meerut) Division one found during the malarial season an average of 60 per cent. with enlarged spleens and 40 per cent. with malarial parasites in the blood. The children of cantonments are the chief reservoirs of malarial parasites, and the source whence a great deal of the malarial infection of troops spreads from year to year.

Fresh breeding places for anophelines are still being created in many cantonments—in road-making, by the removal of earth for new buildings, and in a score of other ways.

The chief anti-mosquito measures required in cantonments embrace rough canalization of streams, irrigation canals and water-courses generally: levelling, grading, and embanking of rain-water channels, ditches and roadside drains; filling up of tanks, excavations and depressions; covering of disused wells; covering with mosquito-proof material or periodical emptying of water cisterns; treating all small collections of water that cannot be abolished with some larvicide once a week; preventing (where possible) excavations for building purposes within cantonments, and removal of brick factories from cantonment limits; and disuse of grass farms within half a mile of barracks when these are near the breeding grounds of anophelines. The mosquito gangs of cantonments who are chiefly used for kerosining collections of surface water should be employed in carrying out much of the work. The work should be carried out systematically, the labour fairly divided amongst the men, and regularly supervised by the malaria officer, senior medical officer, and medical officers of units.

The senior medical officer and malaria officer should be acquainted with all possible breeding grounds of anophelines in the extra-regimental areas of the station and allot tasks to the mosquito gangs employed in these areas, medical officers of units doing the same in regimental areas.

The sanitary detachment, non-commissioned officers and men of all our British and Indian units are now in their annual course of instruction in military sanitation made familiar with the rôle of anophelines in malaria and the methods employed in reducing their numbers. These men might be utilized in the anti-mosquito measures of all cantonments to a large extent. With their aid in most cantonments it would be possible to work out during a single mosquito season the anophelines in existence and the actual malaria carriers amongst these. They are, as a rule, intelligent and keen men. Apart from supervision, all they require to guide them is a sound and well-considered anti-mosquito scheme for the areas in which they are employed.

A great deal of the unskilled labour connected with the reduction of mosquito breeding places can be carried out by the troops themselves in their regimental areas. One has seen this done in several stations with advantage, and we have had several excellent examples of it in India and Burma during the last few years. We should remember that it is our duty to employ all the smaller and least expensive methods before recommending large schemes.

I believe it is possible to reduce the anophelines and the malaria in the cantonments of practically all malarial stations if the matter is taken in hand in a thoroughly methodical way and a continuous anti-malarial policy be adopted from year to year. Patch-work and change of policy are responsible for many failures.

With the progressive decrease of breeding places of anophelines in and around cantonments there will be a corresponding reduction in the amount of quinine that will be necessary for curative and prophylactic purposes in garrisons, and the amount of labour required to keep down the number of breeding places will become yearly less.

There are many cantonments where this has actually taken place—stations in which malaria was prevalent and malignant, but in which the endemicity is now mild.

As instances of cantonments that have been vastly improved by persistent anti-malarial sanitation I

would mention Agra, Mhow, Belgaum, Hyderabad (Sind), Quetta, Bangalore, Cawnpore, River Forts (Rangoon), Mandalay and Lucknow.

In 1909 Agra yielded in our European troops 695 cases, in 1913 only 36, the strength remaining the same. The excellent anti-malarial work that has been in progress in Mhow for the last few years has removed the necessity of issuing quinine prophylactically; the same may be said of Quetta and several other stations. There is ten times less malaria in Belgaum than ten years ago. The River Forts, Rangoon, used to be notoriously malarial, every man going to them getting infected; this is not now the case. Mandalay used to be one of the most malarious places in Upper Burma; it has ceased to be so. In Hyderabad (Sind) in 1908 the malaria ratio was 606 per 1,000 of strength; in 1913 there were only 29 cases throughout the year.

These instances demonstrate the highly satisfactory results obtainable by the active co-operation of all the authorities concerned, combined with an intelligent scheme of anti-malarial sanitation, and serious attention to the treatment of cases of malarial infection both in hospital and subsequently. The work of reducing the breeding places of anophelines is tedious, exacting, and requires unremitting attention and supervision; in the absence of radical and prohibitively expensive operations it has to be carried out from year to year, the work must be uninterrupted; any relaxation will result in much of the advantages gained being lost.

Destruction of adult mosquitoes in barrack rooms is a by no means negligible defensive agency; the collective effort of soldiers in barracks in this respect is capable of greatly reducing the number of anophelines present. Our troops should be encouraged to do this, and small hand-nets and trap should be placed in each barrack room during the anopheline season.

Coolies employed in barracks should invariably be medically inspected before being engaged and periodically examined afterwards, and they should get the same issue of prophylactic quinine as the troops; these remarks apply equally to all followers who sleep in proximity to barracks.

The keeping of European troops at non-malarial hill stations until the malarial season is over is a measure of considerable advantage to efficiency. The transfer of men severely infected with malaria to our convalescent depots on non-malarial hill stations serves the triple purpose of eradicating malaria from the individual, thereby lessening the invaliding rate for malaria, and removing infected men from malarious stations in which, through anophelines, they disseminate malaria. One has made a series of observations on the children of Indian followers of British troops moved to hill stations where there was no initial malaria, and ascertained that a year's residence at such stations eliminates without any treatment 98 per cent. of the malarial infections; 97 per cent. of cases of malarial enlargement of the spleen in children disappear spontaneously in the same period. These conclusions were arrived at from observations made on 997 Indian followers' children in seven different hill stations.

The detection, isolation, and specific treatment of all infected soldiers are of great importance in the prevention of malaria. Malarial patients should, during the anopheline season, be isolated in special wards and supplied with mosquito curtains. All known cases of active malarial infection should be admitted into hospital. This is very necessary, for if not carried out, the men with malaria on returning to the barracks infect their comrades and may get reinfected themselves. The great advantage of remaining in hospital is that all our hospitals are provided with mosquito nets for malarial cases, whilst nets are not universally employed in barracks. All discharged cases of malaria taking quinine curatively should get their quinine *at the hospital* or inspection room daily; this enables the medical officer to see them regularly. During malarial infection the object should be, not only to check the paroxysms, but also to eradicate all the parasites from the blood by the use of quinine. Relapses in soldiers, and in all other bodies of men under discipline, can to a large extent be controlled. There should be but little residual malaria in troops. Relapses occur when previous infection has not been eradicated by proper quinine treatment. All troops and followers in cantonments known to be infected with malaria should be subjected to a course of quinine treatment lasting not less than four months. Were this universally adopted there would, one believes, be fewer cases of relapses in the late winter, spring, and early summer months. The method of treating malarial fever cases with quinine for a week or so and then letting them fall into line with the men who are taking the drug prophylactically is one of the many causes of the continuance of malarial infection amongst our troops. Under such treatment the curative administration of quinine is discontinued just at the time when the patient is most infectious to others through the gametocytes in his blood. The proper way to treat malarial fever in our troops' hospitals in India is to keep the patient in hospital and under quinine and mosquito nets until gametocytes are no longer to be found in the surface blood, then discharge him to attend daily for his course. Generation after generation of gametocytes and schizogonic parasites continue in the spleen and bone-marrow long after they cease to be found in the peripheral circulation—it is this recurring multiplication we should aim at eradicating; until this is done the infected person is liable to relapses, that is, to recurring paroxysms without reinfection, and also through malaria-carrying anophelines to infect others.

In a malarial cantonment during the malarial season when fresh infections are constantly liable to occur, it is practically impossible to decide whether a particular case is one of reinfection or relapse. A careful scrutiny of each case with examination of the blood, and a history of the course of the infection (if any) would probably give us information upon which we could draw inferences as to whether it was a reinfection or a relapse, but such deductions would not be scientifically reliable. The only indication of a reinfection

would be a record to the effect that the preceding attack was caused by a species of parasite different from the one discovered in the blood during the attack under investigation, although this does not necessarily mean a reinfection, as the former infection may have been a mixed one and one species has died out.

Relapse is one of the most common factors in malarial infection; and the asexual cycle is that phase in the life-history of the malarial parasites most frequently associated with the primary infection and with the relapse; and with one relapse and the succeeding one. Relapse frequently follows the so-called spontaneous cure of malaria, because the asexual cycle in such a case often persists in numbers that can be detected by the thick film method in the intervals of apyrexias. Infections treated with small doses of quinine will in all probability relapse, because the parasites of the asexual cycle in the spleen and bone-marrow are very slightly if at all affected thereby. Relapse is less likely to occur when the infection is promptly and vigorously treated, because probably the older the asexual cycle the more resistant to quinine it becomes. When a relapse occurs with the presence of parasites in the peripheral blood during the administration of quinine by the mouth in sufficient doses, faulty absorption of the drug should be suspected.

These statements are based on the assumption that the perpetuation of the asexual cycle of malarial parasites in the blood, spleen and bone-marrow is the sole responsible cause of relapses, and that like *Trypanosoma gambiense* and other trypanosomes in relation to atoxyl treatment in the experimental production of trypanosomiasis in lower animals, the asexual forms of malarial parasites under certain conditions take on a relative immunity against quinine. We have so far absolutely no grounds for believing that relapses are caused in any other way than by latent asexual forms of malarial parasites taking on activity and multiplying in the same manner as they did during the stage of initial infection. Whether the spores of malaria become immune to the action of quinine under the conditions stated remains to be proved, but the assumption that they do gives us a definite and practical line of quinine treatment in the early initial paroxysms.

The special significance of the hypothesis rests in its application in the treatment of malaria. Small doses of quinine even in the slight infections may simply render the asexual cycle relatively immune, so that larger doses, if they had been given early in the attack might have eradicated the parasites, are later without effect. It is probable that were larger doses of quinine given for the first three weeks than those usually administered during the initial infection, and progressively decreasing doses continued subsequently for the remainder of the four months' course, there would be considerably fewer relapses and reinfections. These remarks also emphasize the necessity of all cases of malarial fever reporting sick at once so as to get infected persons under quinine as soon as possible and thus prevent the formation of gametocytes. Relapse cases in cantonments after the real malarial season is over are very largely responsible for the perpetration of malaria through anophelines when the latter start breeding again.

From our reports we can measure the effect of quinine in cases treated in non-malarial hill stations. Men are sent up convalescent from malaria for four to six months, get one relapse, are put under a comparatively mild course of curative quinine treatment for four months, and no further relapses occur; in 98 per cent. of these cases their malaria is eradicated. In a large proportion of cases the same course of quinine treatment would not be successful in the plains, possibly because of reinfections or because the asexual parasites are more immune to the action of quinine in the plains during the malarial season, or for some other yet undiscovered reason.

Our records distinctly show that in those malarious stations in which curative quinine treatment is most persistently carried out relapses are decidedly fewer than in those in which quinine treatment is adopted in a half-hearted way.

One is in possession of abundance of evidence pointing to the necessity of more continuous examination of the blood for parasites in fevers of unknown origin in malarious stations. One group of facts supports this statement. In the Burma Division up to August, 1911, a large percentage of fever cases were returned as pyrexia of uncertain origin, the practice being to rely upon a single examination of a stained blood-smear for malarial parasites. From that month onwards daily microscopical examinations of the blood in all cases of undiagnosed pyrexia was carried out, quinine being withheld until malarial parasites were found in the peripheral blood. Over 9,000 slides were examined in connection with 750 infections. In 1 case parasites were not found until the eighth day, in 2 on the seventh day, in 5 on the sixth day, in 4 on the fifth day, in 11 on the fourth day, in 43 on the third day, in 127 on the second day, the remainder on the first day; in other words, in 25·86 per cent. of proved malarial infections parasites were absent during the first paroxysm. In two Indian battalions quartered in Mandalay, which used to be a very malarious cantonment, six months after the adoption of this change the place of practically all the cases of pyrexia of uncertain origin was taken by malaria in the returns. A similar series of facts were recorded in the 6th (Poona) Division in the last quarter of 1913.

The records of our military hospitals show that frequently malarial parasites are not found in the peripheral blood during malarial paroxysms. The chief reason given for this failure to discover parasites is that the patients are at the time taking quinine prophylactically. One is, however, quite convinced that when malarial parasites are in sufficient numbers in the blood to give rise to malarial paroxysms, they can in the large majority of cases be found in the peripheral blood, especially if the thick film method is employed and quinine is temporarily withheld.

The practice of giving quinine to cases where malarial parasites are definitely known not to exist is unsound therapeutically. One great disadvantage of giving quinine in cases of doubtful fever is that after its use the diagnosis of the case may never be cleared up. When all evidence shows that there are no malarial parasites in the peripheral blood, abstaining from

giving quinine can do no serious harm to the patient in the vast majority of cases. It sometimes happens that the disuse of quinine in such cases for some days enables the diagnosis to be settled by parasites appearing in the finger-blood. Although we know that quinine is a specific in malarial infection, the fact that its use brings about the disappearance of pyrexial phenomena does not prove that the fever is malarial. Quinine is an antipyretic, apart from its plasmocidal properties. I consider that as a routine practice no case of fever should get quinine until malarial parasites or other changes in the blood, or definite clinical manifestations, indicate that the case is one of malarial fever.

Papers have in recent years been published antagonistic to the prophylactic use of quinine, and in several annual reports of garrisons of 1913 the utility of this procedure is questioned. The failure of quinine as a prophylactic of malaria is due to improper dosage, defective methods of administering the drug, postponing its administration too long, or using it in prophylactic doses when it should be given curatively; usually the last named is the cause giving rise to disappointing results, and the ultimate defect will in most cases be found to be a want of completeness in the method of diagnosing actual cases of existing malarial infection. Prophylactic doses of quinine do little or no good when malarial infection is already present; it may possibly be instrumental in creating resistant strains of malarial parasites which perpetrate the infection in the individual and thereby through him lead to dissemination of the infection.

In many stations the mistake is made of not beginning the prophylactic issue of quinine sufficiently early; for one reason or another this issue is postponed until the incidence is seen to be rising rapidly. Under this circumstance a fair percentage of men in barracks are already infected, and through anophelines infect one another. The cases where the infection is latent do not of course report sick, but they are reservoirs of the parasites that enable anophelines to disseminate the malaria. Prophylactic doses of quinine in such cases are, if anything, worse than useless; infection has already occurred and curative doses are required; prophylactic doses possibly harden the parasites to the effects of quinine, and the reputation of the drug by this mistake suffers in two ways.

When all cases of malaria in units are admitted, and such admissions reach 2 per cent. of strength, I consider the prophylactic issue of quinine is justifiable. The longer it is delayed after this the higher will the percentage of fresh infections become during the malarial season. There are circumstances when a prophylactic issue should be made irrespective of the percentage of admissions, *e.g.*, in barracks where mosquito nets are not in use and when there is a sudden rise in the malaria of the civil community around. Assuming a uniform distribution of cases in barracks, any greater percentage than 2 means that one man in each barracks is infected, and that through him in the presence of anophelines malaria will rapidly spread. If time permitted I could quote several instances in which five or six men occupying parallel and consecutive beds in barrack-rooms suffered from the same type of malarial infection, the other men escaping; and one instance in which 13 of 24 men in one room suffered from malignant tertian, the other 11 remaining healthy, and in the adjoining room 9 of the 24 occupants suffered from benign tertian, the other 15 occupants being unaffected by malaria in any form. Under ordinary circumstances in non-epidemic years, however, such spreading of malaria does not occur through cases in the barrack-rooms of European troops, but through the infected anophelines from married quarters, bazaars, and followers' huts invading barrack-rooms.

The effect of the percentage of cases of infection in influencing the incidence of malaria may be seen in every endemic malarial station.

One's personal experience is that the best prophylactic dose of quinine during the malarial season where malaria is comparatively mild is 5 gr. daily; where it is severe, 5 gr. daily for six days and 10 gr. on the seventh day weekly; and where it is very severe, 5 gr. for six days and 15 gr. on the seventh day weekly.

Many factors interfere with the reduction of malaria in cantonments—indifference of the persons infected, want of enthusiasm of those guiding anti-malarial operations, absence of concentrated effort and of universal co-operation in the measures, and, especially, absence of funds necessary to make these measures radically useful. All who are familiar with the difficulties inseparably associated with prevention in endemic malarial cantonments must allow that it is always a heavy task from which there can be no remission.—*Indian Medical Gazette*, August, 1914.

PROTOZOA AND DISEASE.*

By Anton Breinl.

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PHYLOGENETICALLY, the protozoa are placed between plants and animals, and it is the general opinion that no one feature separates the lowest plant from the lowest animals, and the difficulty—in many cases the impossibility—of distinguishing between them is clearly recognized.

The protozoa correspond in their anatomical structure to the units which build up the body of the multiple-celled metazoa, and, like animals and man, they consist of cytoplasm or protoplasm, which is considered to be the carrier of the activities which constitute life, and of a nucleus or a number of nuclei to which different functions are attributed.

Morphologically, protozoa do not show any differentiation into different organs, but within the confines of the single cell are carried on all the essential vital functions which characterize the many-celled animal—nutrition and multiplication are carried on by the one cell.

There are numerous protozoa all over the world in water and dust, leading an independent existence, as,

* One of the Stewart Lectures of the University of Melbourne, 1913.

for example, infusoria. There are other protozoa which lead a facultative parasitic existence, in other words, live symbiotic in and with their host, without causing any harmful effects; and there are finally the parasitic protozoa, which live in the host to its detriment, and which are of special interest, since they are the cause of many and varied diseases. Amongst such diseases caused by protozoa may be mentioned amœbic dysentery, malaria, Leishmaniosis (kala-azar, and Oriental boil). They are the cause of sleeping sickness and of numerous diseases in stock. There are a great number of species which live in the blood of wild animals and birds. Others, like the Coccidia, invade the epithelial cells of the intestine of different species of animals, and emigrate from the intestine into the liver, causing extensive and marked lesions in this organ. Many of the representatives of another branch—the Neosporidia—cause extensive skin lesions in fishes and have been found in the intestines of insects.

The majority of the parasitic protozoa belong to the large class of Sporozoa, so-called because they multiply, in one stage or another of their life-history, by spore formation.

Parasitic protozoa differ in many ways in their action upon their host from bacteria. Bacteria, as a rule, multiply within the host until they have overcome his resisting power and caused his death, or until the host has been able to form antibodies, a poison counteracting the bacteria and their products, in sufficient quantity to retard their further multiplication and to accomplish their annihilation.

Blood protozoa, on the other hand, undergo, as a rule, a series of definite changes called the life-cycle in the warm-blooded host, and morphologically different forms are found at different stages of the disease in varying numbers.

The parasite of benign malaria, for example, enters, in its youngest stage, the red blood corpuscles of its host. It has the shape of a signet ring, consisting of cytoplasm and the nucleus. Soon after the parasite has entered the blood corpuscles, the whole parasite increases in size; very soon the chromatin of the nucleus breaks up into numbers of particles, which collect a certain amount of cytoplasm around themselves, and after a varying period—in benign malaria about forty-eight hours—the blood corpuscles which contain the parasites burst open and the young spores become free, and soon afterwards attach themselves to new red-blood corpuscles, enter them and begin the same cycle anew.

The parasite of sleeping sickness, *Trypanosoma gambiense*, undergoes a developmental cycle analogous to the malaria parasite. At a given time the peripheral blood of men may contain an enormous number of parasites. If the blood of the same men be examined one hour or so afterwards, the parasites may have disappeared so completely that even the most diligent search will not reveal the presence of a single parasite, and it may be days, weeks, and often months before the parasite can again be found in the same patient. This negative interval coincides, as a rule, with a considerable subjective improvement.

All the observations on the life-history of the pathogenic protozoa seem to prove that there must be a close relationship between the action of the parasite on the host and the reaction of the host to the presence of the parasite, and open up a wide field for original work, namely, on the nature of immunity against protozoa and its relation to the life-cycle of the parasite. In spite, however, of the strenuous efforts of a great number of highly skilled observers, our knowledge has not progressed very far in this direction.

Protozoic immunity differs essentially in one respect from bacterial immunity. Bacteria only occur in one shape and form and stage in the organism. Protozoa, on the other hand, occur in different shapes and forms and stages, and whilst at one stage of the infection the organism has been able to combat one phase of the parasitic invasion, the parasite is able to undergo morphological changes in such a way that the body has to bring forth new efforts in order to counteract the effects of the parasite in its new phase.

If a small number of trypanosomes be inoculated into the abdominal cavity of an experimental animal, multiplication sets in, and after a certain time the parasites enter the blood-stream of the animal. Even the most careful examination of the animal's blood during the first few days does not reveal the presence of trypanosomes; the animal is in the incubation period. After a varying interval, which, on the whole, corresponds to the number of parasites injected, the parasites have become numerous enough in the peripheral blood of the experimental animal to be detected by microscopical examination. They continue to multiply, reaching their first maximum number after a few days. Suddenly the parasites disappear, and for days, sometimes weeks, no trace can be found in the peripheral blood of our animal. After a varying interval, however, the parasites reappear again, at first in scanty numbers, then multiply and reach a second maximum, which may or may not be slightly higher than in the first instance. After this second maximum the parasites disappear again, and a second negative phase is observed. This play and counterplay repeats itself more or less often until the parasites become so numerous that the peripheral blood is swarming with them, and at this stage the animal succumbs to the infection.

The question of the fate of the parasite during this negative interval was difficult to solve. Careful observations of the blood and organs, carried out over prolonged periods, revealed the fact that the parasites undergo morphological changes at the time when the first maximum in numbers is reached. The parasite of sleeping sickness, *Trypanosoma gambiense*, possesses two nuclei, a small one situated at one end and a larger one placed in the centre, the former in all probability controlling the vegetative function of the cell, the nutrition, and the latter the reproductive function. At a time when the parasites begin to disappear from the peripheral circulation an interaction takes place between these two nuclear structures, a chromatin band grows from the smaller nucleus to the larger one. This phenomenon can, however, only

be seen in an extremely small number of parasites. The majority of them undergo disintegration, the cytoplasm becomes vacuolic, and the majority of the parasites break up, and the fragments are eaten up by the phagocytes, the policemen of the blood. If we take the blood serum at this stage of the infection and mix it with parasites taken from another animal, but in an earlier stage, then we find that the serum acts in the test-tube in exactly the same way as in the body, and we may observe under the microscope that the parasites are destroyed.

With regard to the smaller number of parasites in which the interaction between the two nuclear structures has taken place, a further development takes place. The cytoplasm of these parasites becomes denser, the chromatin of the nucleus becomes more concentrated, and the smaller forms which result, consisting of a nucleus and a small ring of cytoplasm, take refuge in the spleen and bone marrow, and there lie dormant for varying periods awaiting the opportunity to begin life again and give rise to a new generation of parasites. These forms have rightly been termed "latent bodies," as they are the parasites of the "latent stage of the disease."

The observation that the serum taken at the crisis (that is, at the time when the parasites begin to disappear) causes the destruction of other parasites of the same species, seems to prove that a formation of certain immune bodies, antagonistic to the parasite, and therefore termed "antibody," has taken place in the serum, and that these are the cause of the disappearance of the majority of the parasites from the blood. The presence of this immune body in the serum is unfortunately only of short duration. In the course of a longer or shorter space of time these "antibodies" are excreted or broken up, and give the parasites an opportunity to leave their hiding place with impunity.

In the case of sleeping sickness, the faculty of the host to produce substances which are harmful to the parasites seems only to be a limited one, since after several attacks and latent periods the resources of the animal organism become exhausted, giving the parasite the freedom to multiply indefinitely and cause the death of the host.

The foregoing observations show that protozoic immunity is intermixed with, and dependent on, the life-history of the parasite, and *vice versa;* in other words, in protozoic diseases, the parasites act first upon the animal organism, which reacts in a protective sense, and forces the parasite to undergo a further development in its life-history.

Similar and analogous changes take place in the case of infections with the parasite which causes relapsing fever in different parts of the Tropics, and is called spirochæta, an extremely small thread-like body. In cases of relapsing fever active and latent periods follow each other at varying intervals, clinically characterized by attacks of fever and feverless periods. The spirochætes, which are present in enormous numbers in the blood during the fever period, suddenly disappear completely, only a few of the parasites coiling themselves up in the cells of the liver and spleen, which, as soon as the elements in the blood serum hostile to the parasites have ceased to exist, break up into numerous fine particles, out of which the new generation develops.

Other protozoa, especially the non-pathogenic protozoa, which live in the host without causing injury—as, for example, *Trypanosoma lewisi*, a parasite of the common wild rat—differ in many respects from the pathogenic trypanosomata. These parasites, after they have entered the animal host, multiply slowly, are present during the whole duration of the infection, and finally disappear. Even in these cases the multiplication during the first stages of the infection differs from that of the later stage. Whereas in the early stages the multiplication takes place by segmentation, one parasite breaking up into a number of smaller ones, in the later stage multiplication takes place by simple fission, each parasite splitting into two daughter cells. Morphological differences in the parasites are well marked in different stages of the infection, and tend to lead to the conclusion that the animal body has produced substances which have forced the parasites to change their tactics and morphology.

Malaria parasites differ in many respects from trypanosomes. It is a well-known fact that the fever caused by the malaria parasite (simple tertian form) is an intermittent fever—fever to-day, a feverless interval the second day, and fever again on the third day. During the febrile interval parasites are either absent from the blood or only present in certain stages, the sexual stage referred to later. The rise of temperature always corresponds with the sporulation of the parasites, that is, to the period when the blood corpuscles break up, setting free numberless small forms, the schizonts, which attack new blood corpuscles, develop in them and repeat the same life-history over and over again. A great number of these small parasites must perish, otherwise the human organism would succumb to the number of parasites at a very early stage of the infection.

In the normal course of malaria, if the patient be not treated, relapse follows relapse; the clinical symptoms, such as anæmia, enlargement of the spleen, and wasting, as a rule, become more marked with each relapse, a slight improvement taking place during the interval. After some time, however (several months), the symptoms reach a fixed limit, and the patient shows the typical clinical picture of chronic malaria, anæmia with its accompanying œdema, and with enlargement of the spleen. In many cases, especially in native children, improvement sets in after the symptoms have reached the fixed limit. The relapses lose their regularity, the feverless intervals become longer and longer, the clinical symptoms become less marked, but on examination parasites can still be found in small numbers in the blood. Complete recovery may take place, followed by a partial immunity.

A practical illustration of the condition referred to can be found in any native community where the natives live in villages. One of the most constant symptoms of malarial infection is the enlargement of

the spleen. On examining the children living in a malarial district, from baby to about 4 or 5 years, enlargement of the spleen may be found in as many as 90 to 100 per cent. of all the children examined, and this enlargement becomes less marked in the older children.

One may often examine a great number of adult natives in the same village without finding any signs of latent malaria, and this occurrence proves that the human organism produces an immunity against the malaria parasite. In other words, when infection had taken place, especially in early childhood, the malaria parasite, which has been a true parasite at first, has become a saprophyte, and although still present in very small numbers, does not cause clinical symptoms. It is, however, remarkable to note that this equilibrium between body and malaria parasite is very unstable, and may become easily disturbed. Any of the conditions which cause the slightest lowering of the resistance of the human body may give rise to a typical attack of malaria. There are cases on record where, even after a fever-free interval of from four to six years (the person had been living in a malaria-free country) malaria parasites have made their appearance again at a time when some other disease had lowered the vitality of the patient. This also accounts for the fact that in many instances malaria fever attacks can often be noticed after the infected person has left the malaria district. It is of common occurrence that people returning home from the West Coast of Africa, after a stay of one or more years, show the first signs of fever when nearing Gibraltar, whilst persons who have been resident in New Guinea for quite a long period have noticed their first attack on their arrival in Queensland during the winter.

Similar to the malarial immunity is that produced in bovine piroplasmosis—tick fever in cattle. It is well known that the infection of tick fever in cattle runs a mild course if the parasite invades young animals, whilst older animals succumb, as a rule, to the infection. If the infection takes place in a young animal a permanent immunity is conferred upon this beast. Parasites can, as a rule, be found for a whole year after the onset of the disease, if not by direct microscopic examination, at least by sub-inoculation experiments of the blood into a susceptible animal.

Protozoic immunity is a very difficult problem indeed, and the advances made up to now are only slight. At the same time it is a very important problem, as an insight into the ways and means Nature employs to overcome protozoic infections may lead to the successful treatment of the disease in question, in the same way as the advances in our knowledge of the mode of production of bacterial immunity, have done so much to make diseases such as diphtheria and lockjaw easily amenable to treatment. The investigations into protozoic immunity on the lines of those employed in the case of bacterial immunity have, up to now, completely failed, and new methods and modes of reasoning have to be devised to further our knowledge of this subject.

Protozoa differ in other respects from bacteria in that they are transmitted by some biting insects, which act as intermediary hosts, passing through definite changes within the insect. For example, the tsetse-fly, *Glossina palpalis*, acts as intermediary host to the sleeping sickness parasite; different species of anophelines as intermediary hosts for the malaria parasite; ticks, as *Ornithodorus moubata*, as intermediary hosts for the African relapsing fever; and various Boophilus as intermediary hosts for the tick fever in cattle.

Investigations into the life-history of protozoa have taught us that the parasites undergo a rejuvenation in the intermediary host, and have shown us that there are in nearly all protozoa which have been carefully investigated, two distinct and different life-cycles—one life-cycle in the body of the host, and a second quite distinct life-cycle in the intermediary host.

I will give, as an illustration, the life-history of the malaria parasite, *Plasmodium vivax*, in its intermediary host, a certain mosquito, an anopheles, of which only a limited number of species are capable of offering the malaria parasite a welcome home for further development. The sexual forms are taken up with the blood of patients by the female mosquito. The female gamete, or macrogametocyte, escapes from the red-blood corpuscles after it has reached the intestine of the mosquito, and undergoes changes in some respects analogous to those which take place in the germ cells of the metazoic organism. The nucleus divides, and some of the chromatic particles leave the cell; the nucleus of the macro gametocyte has undergone reduction division, and has become a macrogamete.

The microgametocyte, the male element, changes in a similar way. The chromatin of the nucleus breaks up into a number of particles which migrate to the periphery of the cell. Shortly afterwards fine whip-like filaments called flagella shoot out from the periphery of the cell, which lash about and show lively movements. These small filaments finally break off and form microgametes—the male element. Each microgamete consists of a filament of cytoplasm, over which is spread the chromatin in small dots.

Soon after the formation of the microgametes, the male and female elements conjugate, the nuclei fuse, and the fertilized parasite, called the ookinete, elongates and becomes pointed at one end; the pigment is placed mostly at the posterior end of the parasite, and is often thrown out.

At this stage the parasite penetrates the lining of the stomach of the mosquito and comes to rest on the outside of the stomach, surrounding itself with a thin membrane. The parasite now begins to grow at a great rate, the nucleus divides into a large number of daughter nuclei, which form the sporoblasts; afterwards the chromatin of the sporoblasts divides into a great number of smaller chromatin particles, which move towards the periphery and cause numerous projections. This cyst, which has increased in size considerably, now bursts, and the contents escape into the body cavity of the insect and are carried by the blood-stream of the insect throughout the whole body, and finally find their way into the salivary glands. This process in the mosquito takes ten to twelve days.

When the infected mosquito feeds on a second person, the small parasitic forms pass from the mosquito into the blood-stream of the person by way of the wound, attack the blood corpuscles of the new host, and begin to multiply.

From this description it is apparent that the parasites of malarial fever have to undergo complicated changes before being able to enter the new host.

Many of the other protozoa undergo a complicated development in the intermediary host, but none of the life-history is as definitely known as that of the malaria parasite.

Trypanosomes most probably undergo a sexual development in the tsetse-fly, which, however, is not yet clearly understood. The life-cycle of one species of trypanosome, *Trypanosoma lewisi*, found in the wild rat, is better known. The trypanosomes are taken up with the blood by the rat louse, grow larger, and resemble morphologically forms which occur as "wild parasites," harmless lodgers in different insects.

The work of the life-history of parasitic protozoa through the intermediary host is complicated by the occurrence of other parasites in the respective insects, which resemble morphologically the changed form of the parasite in question.

For example, two trypanosomes, *T. grayi* and *T. tullochi*, which occur commonly in the tsetse-fly, resemble closely that of sleeping sickness in some of its stages.

The fact that parasitic protozoa resemble in many stages of their life-history other protozoa which live as harmless commensales in the body cavity of different insects, is a very suggestive one, as it seems to point to the conception that parasitic protozoa have been evolved in the course of time from originally harmless parasites, which were taken up by insects and became non-parasitic commensales before acquiring their parasitic habits.

In the Tropics a great percentage of all the animals, mammals, birds, and reptiles harbour parasitic protozoa, which, although morphologically very similar, often even identical, are specific for the species of animals in which they occur. For example, *T. gambiense*, the sleeping sickness parasite, and *T. brucei*, causing the tsetse-fly disease in cattle, are morphologically nearly identical, biologically quite different. The sleeping sickness parasite only causes slight and transient infections in horses and cattle; the cattle parasite never causes infection in man. Most of the various blood parasites which inhabit the blood corpuscles of lower animals and birds are specific for the species in which they occur, never being able to live and multiply in any other species.

The diseases caused by parasitic protozoa occur mostly in tropical climates. The most important disease is malaria, which occurs nearly as far as the Tropics extend. There are at least three different varieties of the parasite of malarial fever—the quartan, simple tertian, and malignant tertian parasite. The quartan sporulates every fourth day, and causes rise in temperature, rigor, &c.; the simple tertian sporulates every other day, and the malignant tertian parasite runs a more or less irregular course.

Sleeping sickness is caused by *T. gambiense*, a protozoon belonging to the large group of the hæmoflagellata. Sleeping sickness has spread throughout many parts of Africa with a tremendous mortality, depopulating whole districts. It is a very chronic disease, characterized in its early stages by a marked swelling and inflammation of the lymph glands. In the later stages the brain becomes attacked, and the round-celled infiltration in the perivascular lymph spaces gives rise to the mental stupor and drowsiness from which the disease gets its name.

Kala-azar, a disease due to a micro-organism, *Leishmania donovani*, occurs in India. Patients show a great enlargement of the liver and spleen, and emaciate to a skeleton. The fever is irregular and persistent. This disease is always fatal. A morphologically similar parasite is the cause of leishmaniosis infantum, a form of the disease which attacks mostly infants, and shows as clinical sign a great enlargement of the spleen, which is followed by well-marked emaciation.

Similar parasites cause the lesion known as Oriental boil, a slowly spreading ulcer on different parts of the body, occurring in Bagdad, Delhi, Brazil, and other parts of the world.

Spirochætes are too well known as disease producers. Syphilis, yaws (a children's disease amongst the black inhabitants of the Tropics), the different forms of relapsing fevers—the African, Indian, European, American—are produced by spirochætes. Parasites which give rise to amœbic dysentery belong to the phylum of the protozoa, and show a fairly wide distribution throughout the Tropics.

Personal Notes.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment or Department, and the Period for which the Leave was granted.

Bomford, Captain T. L., I.M.S., to April 3, 1915.
Coleman, Lieutenant-Colonel A., I.M.S.
Crimmin, Colonel J., I.M.S.
Dawson, Lieutenant-Colonel A. W., I.M.S.
Graham, Captain G. F., I.M.S., to June 5, 1915.
Greson, Lieutenant E. J., I.S.M.D.
Harrison, Major C. B., I.M.S.
Hendley, Colonel H., I.M.S., to October 22, 1914.
Heriz-Smith, Lieutenant G. V., I.M.S., to October 5, 1914.
Jack, Captain W. U., I.M.S.
Jolly, Captain G. A., I.M.S., to February 15, 1915.
Kelly, Major T. B., I.M.S., to March 15, 1915.
Kolapore, Captain F. J., I.M.S., to December 7, 1914.
Leonard, Major W. H., I.M.S., to October 16, 1914.
Little, Captain G. L. C., I.M.S., to November 20, 1914.
McCarthy, Lieutenant P., I.S.M.D., to November 12, 1914.
McCowen, Major W. T., I.M.S., to December 14, 1914.
McNeight, Captain A. A., I.M.S., to September 7, 1914.
Melville, Major C. W., I.M.S., to August 31, 1914.
Millar, Captain G. McG., I.M.S., to November 25, 1914.
Pal, Captain S. C., I.M.S., to December 20, 1914.
Pridham, Captain A. T., I.M.S., to April 5, 1915.
Robertson, Colonel R., I.M.S., to November 7, 1914.
Seton, Colonel B. G., I.M.S., to November 30, 1914.
Stevenson, Captain F., I.M.S., to October 12, 1914.
Thakur, Captain K. S., I.M.S., to May 22, 1915.
Thomas, Captain A. N., I.M.S., to November 9, 1914.
Thomson, Lieutenant-Colonel G. S., I.M.S., to March 28, 1915.
White, Captain M. F., I.M.S., to September 30, 1914.

Original Communications.

NOTES ON THE HYPHOMYCETES FOUND IN SPRUE: WITH REMARKS ON THE CLASSIFICATION OF FUNGI OF THE GENUS "MONILIA GMELIN 1791."

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IN the present paper I do not propose to discuss the etiological rôle played by fungi in sprue, but merely to study the subject from a botanical point of view.

Historical.—Kohlbrugge, in 1901 (see *Arch. f. Schiffs u. Tropen-Hygiene*, 1901, No. 12), found in cases of sprue a fungus which he identified with the thrush fungus (*Monilia oïdium, Endomyces, Saccharomyces albicans*). He made a very complete histological study of one of his cases which ended fatally, and emphasized the fact that the fungus in sections of the tongue, &c., had invaded the deep strata of the mucosa, the glands, and portions of the submucosa. He concluded that the thrush fungus, or *Monilia albicans*, was the cause of the disease. Kohlbrugge's findings were confirmed by many observers, Le Dantec suggesting for the disease the term *Blastomycosis intestinalis.*

From 1909, being interested in the subject of fungi in general, I have studied the hyphometic intestinal flora of a certain number of typical cases of sprue, as well as of other conditions and of normal individuals, and I have come to the conclusion that there are several different species of intestinal monilias (*M. intestinalis, M. fæcalis*, &c.). In my paper on sprue in the *Rivista Critica di Clinica Medica*, 1912, I discussed all the various theories, bringing forward what had been found in favour of each by myself and others. I did not express any opinion as regards the etiological rôle of these fungi in sprue, except that they were probably the cause of the frothy diarrhœa, having noted that this frothy diarrhœa generally improves after strong doses of bicarbonate of soda. I thought that sodium bicarbonate given in large doses, by decreasing the acidity of the intestinal contents, might check the growth of fungi, which, as is well known, grow better on acid than alkaline media.

In 1913 Dr. George Low and myself described a new species of monilia we found in a case of sprue, and called it *M. decolorans*. We considered this monilia and similar ones to be probably the cause of some of the important symptoms of the disease, such as frothiness of the stools, &c., but we were not inclined to consider them to be the primary cause of the malady; we quoted in analogy the example of scabies, in which the main part of the symptoms is due to the secondary invasion by staphylococci, and not the primary or real cause, the acarus. We quoted also the example of pulmonary tuberculosis in which a very important symptom, the serotine fever, is not due to the tubercular bacillus, but to the secondary streptococcal infection.

Recently Dr. P. Bahr has published a report of his investigation of the malady (*Transactions of the Society of Tropical Medicine and Hygiene*, April, 1914), in which he identifies the fungi found in sprue with the thrush fungus (*M. albicans*), completely supporting Kohlbrugge. He seems also to be inclined to agree with Kohlbrugge that *M. albicans* is the primary cause of the disease.

Presence of Fungi in Sprue.—In practically every case of sprue it is easy to put in evidence hyphomycetes in the stools and scrapings from the tongue. The microscopical examination of the frothy motions will often reveal the presence of spore-like bodies and mycelial elements typical of the genus *Monilia*. Even when fungi are not observed microscopically they can generally be put in evidence by cultures, inoculating glucose agar or glucose broth tubes with a particle of the stools. Though generally in much less amount it is not rare in the Tropics to find microscopically identical fungi in stools of patients suffering from other diseases (dysentery, enteric, &c.), and occasionally in normal people. Microscopically identical fungi may be isolated also from the air, tea dust, copra dust, &c.

Botanical Position: Differentiation of Intestinal Monilias and Monilias in general.—As already stated, all monilias found in sprue as well as in other conditions, such as bronchomycosis, thrush, otomycosis, those found in the air, tea dust, copra dust, &c. have all been considered to be the same species and identified with the thrush fungus or *M. albicans*. Since 1909 in a series of papers I have expressed the opinion, based on a certain number of experiments, that the term "thrush fungus," or *M. albicans* (*oïdium, saccharomyces, endomyces albicans*), has been used to cover a large number of different species (possibly even different genera) of fungi, in the same manner that, till some years ago, the term *Bacillus coli* was used to indicate a prodigious number of different bacteria, in the same manner that the term *Trychophyton tonsurans*, till fairly recently, covered numerous different fungi, belonging not only to different species but to different genera, such as the genera *Epidermophyton microsporon, Endodermophyton.* This, in my opinion, erroneous conception of *M. albicans* has been due to the classification of such fungi being based hitherto solely on their morphological and microscopical characters and gross appearances of cultures on solid media. Since 1908 I have suggested the classification of such fungi should be based not only on their morphological appearances, but also, and principally, on (1) their action on litmus milk and gelatine; (2) their action on carbohydrates; (3) on agglutination and immunization phenomena, whenever possible.

Action of Monilias on Litmus Milk and Gelatine.—Some monilias coagulate milk, others do not; some monilias render it acid without coagulating it; some strains decolorize the medium. The greatest number of strains in my experience do not liquefy gelatine, while a few, including the original *M. albicans, sensu stricto*, do liquefy this medium.

Action of Monilias on Carbohydrates.—I have always

used a very large number of sugars, but for practical purposes the following are sufficient for the identification of most species: glucose, saccharose, levulose, galactose, maltose, mannite, lactose, provided the results are considered together with the action of the fungi on litmus milk and gelatine. I have observed in analogy to what takes place when dealing with bacteria that certain well-defined species (for instance, *M. intestinalis*, *M. tropicalis*) do not change to any appreciable extent their fermentation properties in the course of time; while with other species the fermentation properties are not constant. I have noted also that strains which do not ferment certain sugars may be trained at times to do so, but this is the case also with many bacteria. It is well known, for instance, that Penfold has been able to change the fermentative properties of germs of the typhoid colon group to a remarkable degree; still no one denies the validity of the usual fermentation tests in differentiating between organisms of this group.

dust, &c. It is quite possible that future investigation may show that some of the species created cannot stand, but I venture to say that my main point, viz., that there is a plurality of species of the so-called *M. albicans*, or thrush-fungus, will be confirmed.

I will limit myself to give here a description of monilias found in stools, and only those species which I consider to be good. Some of these species have already been published, but I will repeat here their description for the reader's convenience.

For those who may be interested in the comparative study of these fungi, I annex also a table containing species derived from cases of bronchomycosis, thrush, tea dust, &c.

Monilia intestinalis, *Cast.* 1911.—Microscopically has all the characters of the genus *Monilia*; grows abundantly on slightly acid sugar media, giving rise to large white colonies which soon coalesce into a cream-like abundant growth. The growth is composed practically of only globular yeast-like cells,

TABLE I.—Intestinal Monilias.

	Litmus milk	Glucose	Lævulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrin	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Broth	Peptone water	Indol	Gram	Gelatine	Serum	Neutral red	Inosite	Salicin	Amygdalin	Inodulcite	Glycerin	Erythrite
M. asteroides, Cast. 1914	AC	A	A	A	A	A	A	A	0	A	A	0	0	0	A	T	C	..	+	..	0	..	..	..	..	..	..	..
M. fæcalis, Cast. 1911	A / DPS	AG	AG	AG	AGS	AGS	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. insolita, Cast. 1911	AS / Alk	AG	AG	AG	AG	AG	0	AS	0	0	0	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. intestinalis, Cast. 1911	ADS	AG	AG	AS	A	A	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. rotundata, Cast. 1911	AC	A	A	A	A	0	A	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. decolorans, Cast. and Low 1913	DFC	AGS	AG	AGS	A	A	0	0	0	A	0	0	0	0	0	C	C	0	+	0	0	0	0	0 / Alk	0	0	A	0

A = acid, G = gas, C = clot (milk), clear (broth and peptone water), D = decolorized, P = peptonized (milk), A/Alk = acid then alkaline, S = slight, + = positive result, F = fine, 0 = negative result, viz., neither acid nor gas in sugar media, non-production of indol, non-liquefaction of serum or gelatine, as the case may be.

As regards the use of immunization, agglutination and complement fixation phenomena for the differentiation of monilias, unfortunately these are experiments which take a very great deal of time. I may say, however, that rabbits inoculated subcutaneously with repeated small doses of cultures of monilias often develop agglutinins in their blood, and these are to a certain extent specific, viz., the inoculated rabbit develops a distinct amount of agglutinins only for the species with which it has been inoculated. It would seem from the experiments made—which, however, I consider far from being complete—that the classification data obtained in this way correspond broadly to those obtained by the action of the organisms on milk, gelatine and sugar broths.

Description of Certain Species of Monilias found in Cases of Sprue.—In previous papers I have given a description of numerous species of the genus *Monilia* as found in stools, sputum, &c., in tea dust, in copra while in the water of condensation globular cells and mycelium may be found together. A little mycelium may be found, however, also in the growth on the slope. Ascus formations are absent, gelatine and serum are not liquefied, litmus milk is slowly decolorized, the decolorization starting at the bottom of the tube. No clotting. This monilia produces acid and gas in glucose and levulose, acid in maltose, galactose, saccharose, does not ferment lactose, mannite, dulcite, dextrin, raffinose, arabinose, adonite, inulin, sorbite.

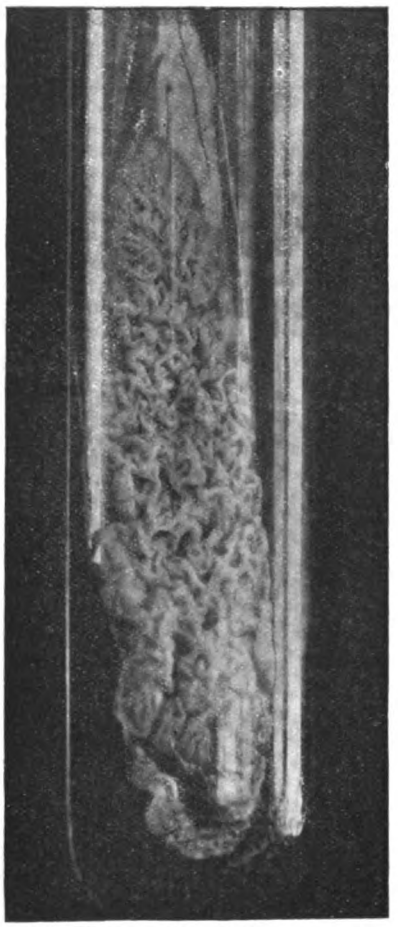
Origin.—Isolated by me in three cases of sprue.

Monilia fæcalis, *Cast.* 1911.—Grows abundantly on sugar media, giving rise to white colonies which soon coalesce. Milk is rendered first slightly acid, then alkaline, gelatine not liquefied. Serum is not liquefied; a dark pigmentation often develops on the surface of the medium round the growth; this pigmentation may be lost in sub-cultures.

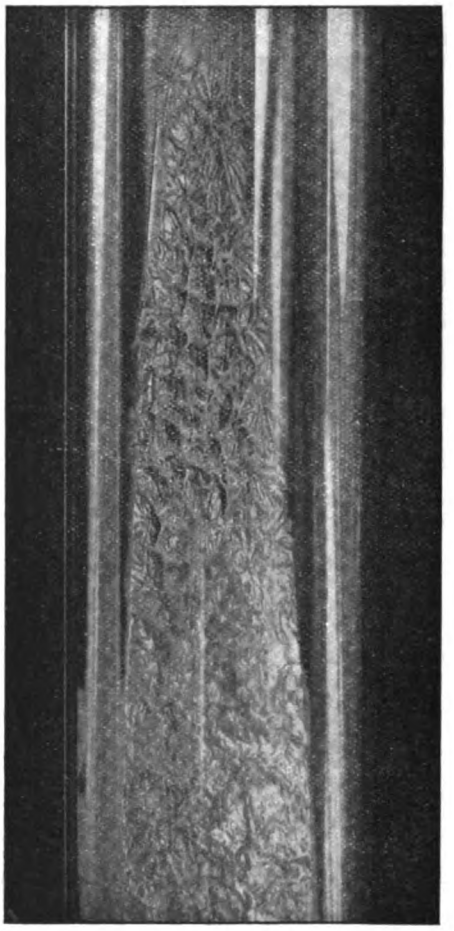
TABLE II.—Table showing Monilias so far found, with Names in Alphabetical Order.

	Litmus milk	Glucose	Lævulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrin	Raffinos	Arabinose	Adonite	Inulin	Sorbite	Broth	Peptone water	Indol	Gram	Gelatine	Serum	Neutral red	Inosite	Salicin	Amygdalin	Isodulcite	Glycerin	Erythrite
M. albicans, Robin. 1853	AC	AG	AGS	AGS	AG	AVS	0	0	0	0	0	0	0	0	0	CTP	C	0	+	+	+S	0	..	..	..	..	..	..
M. asteroides, Cast. 1914	AC	A	A	A	A	A	A	A	0	A	A	0	0	0	A	T	C	..	+	..	0	..	..	..	..	..	..	..
M. blanchardi, Cast. 1912	AVS / Alk	AGS	A	A	A	A	0	0	0	0	AS	0	0	AVS	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. bronchialis, Cast. 1910	0	AG	AG	AG	0	AGS	0	0	0	A	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. burgessi, Cast. 1912	0 / Alk	AGS	A	AGS	A	AGS	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. chalmersi, Cast. 1912	AS / Alk	AG	AG	AS	AGS	AG	0	0	0	0	AS	0	0	AGS	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. decolorans, Cast. and Low 1913	DFC	AGS	AG	AGS	A	A	0	0	0	A	0	0	0	0	0	C	C	0	+	0	0	0	0	0 / Alk	0	0	A	0
M. enterica, Cast. 1911	0 / Alk	AG	AG	AG	AG	AG	0	AS	0	AS	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. fæcalis, Cast. 1911	A / DPS	AG	AG	AG	AGS	AGS	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. guillermondi, Cast. 1910	0 / Alk	AG	AG	AS	A	AG	0	0	0	0	AGS	0	0	0	0	CTP	C	0	+	0	0	0	..	..	..	..	..	..	..
M. insolita, Cast. 1911	AS / Alk	AG	AG	AG	AG	AG	0	AS	0	0	0	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. intestinalis, Cast. 1911	ADS	AG	AG	AS	A	A	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. krusei, Cast. 1909	0	AG	AG	0	0	0	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. lustigi, Cast. 1912	AS / D	A	AGS	AVS	A	AGS	0	0	0	A	AGS	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. negrii, Cast. 1911	AVS / Alk	AG	AG	AS	AGS	AG	0	0	0	0	AGS	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. nivea, Cast. 1910	0 / Alk	AG	AG	AG	AG	AGS	0	0	0	0	AG	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. nitida, Cast. 1910	A / DC	AG	AG	A	A	A	A	A	0	AVS	AS or 0	0	0	0	0	CTP	C	0	+	0	0	0	..	..	..	..	..	..	..
M. paratropicalis, Cast. 1909	AS / Alk	AG	AG	AG	AG	AG	0	0	0	AVS	0	0	0	0	0	CTP	C	0	+	0	0	0	..	..	..	..	..	..	..
M. perryi, Cast. 1912	AS / DAlk	A	AGS	A	A	AGS	0	0	0	0	AS	0	0	AVS	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. pinoyi, Cast. 1910	0	AG	AG	AG	0	0	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. pseudotropicalis, Cast. 1909	ACS	AG	AG	0	AGS	AG	AG	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. pulmonalis, Cast. 1911	0 / AlkD	AG	AG	AG	AGS	AG	0	AVS	0	0	A	AGS	0	0	0	CTP	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. rhoi, Cast. 1909	AS / Alk	AG	AG	AVS	AGS	AG	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. rotundata, Cast. 1911	AC	A	A	A	A	0	A	0	0	0	0	0	0	0	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..
M. rugosa, Cast. 1910	A / PSCS	AS	AS	AS	AS	AS	0	0	0	0	0	0	0	0	0	C		0	+	0	0	0	..	..	..	..	..	..	..
M. tropicalis, Cast. 1909	A or 0	AG	AG	AG	AGS	AGS	0	0	0	0	0	0	0	0	0	C	C	0	+	0	0B	0	..	..	..	..	..	..	..
M. zeylanica, Cast. 1910	ACS	A	A	A	A	A	AS	0	0	A	AVS / GVS	0	0	AVS	0	C	C	0	+	0	0	0	..	..	..	..	..	..	..

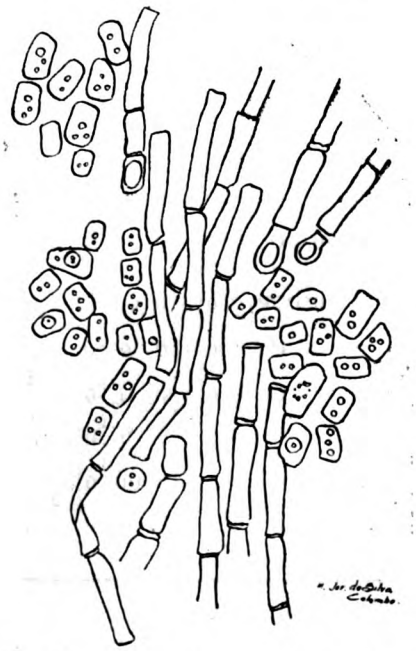
Abbreviations used in the table: A = acid, G = gas, C = clot (milk), clear (broth and peptone water), CTP = clear at first then thin pellicle present, D = decolorized, P = peptonized (milk), pellicle (broth), Alk = alkaline, A/Alk = acid, then alkaline, S = slight, VS = very slight, B = brown pigmentation of the medium, 0 = negative result, viz., neither acid nor clot in milk, neither acid nor gas in sugar-media, non-production of indol, non-liquefaction of gelatine or serum, as the case may be, + = positive result, liquefaction of medium; F = fine.



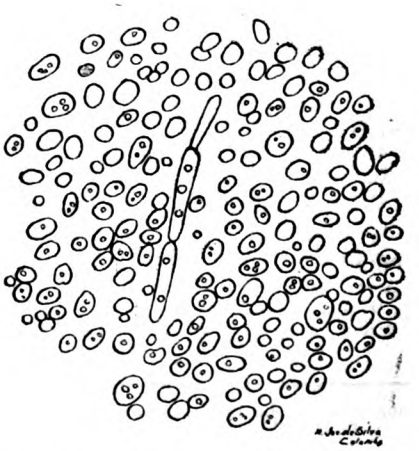
Monilia rotundata. (Glucose agar.)



Monilia asteroides. (Glucose agar.)



Monilia asteroides. Fresh preparation from a glucose agar culture.



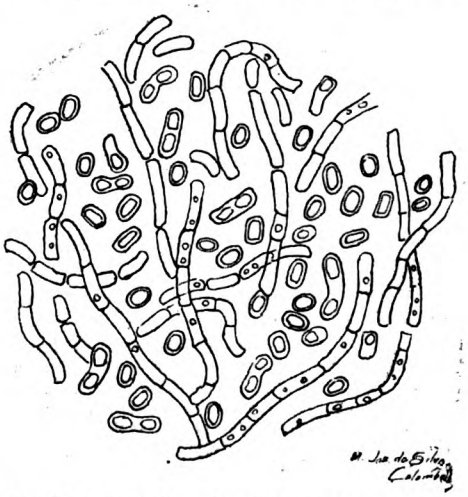
Monilia intestinalis. Fresh preparation from a glucose agar culture.



Monilia intestinalis. (Glucose agar.)

Origin.—Isolated from two cases of sprue, one of enteric, one of ptomaine poisoning; also from a sputum which had been collected in a dirty receptacle.

Monilia insolita, Cast. 1911.—Colonies on sugar media white. Milk is first very slightly acid, then alkaline, and becomes slowly decolorized. Gelatine is not liquefied. The growth on serum dose not become surrounded by a zone of dark pigmentation; the medium is not liquefied. The fungus produces acid and gas in glucose, levulose, maltose, galactose, saccharose, produces often slight acidity in mannite and does not ferment lactose, dulcite, dextrin, raffinose, arabinose, adonite, inulin, sorbite.



Monilia rotundata. Fresh preparation from a glucose agar culture.

Origin.—This monilia was isolated from the stools, saliva, and scrapings of tongue, from a case of sprue, stools of two cases of enteric, and a normal individual; also from sputum.

Remarks.—It is probable that this monilia is in reality merely a variety of *M. fœcalis.*

Monilia tropicalis, Cast. 1900.—On glucose agar large white colonies appear which later on coalesce. Gelatine and serum not liquefied; there is no brownish or black decoloration of the serum. Litmus milk is not changed, or is rendered slightly acid: it is never clotted. This monilia produces acid and gas in glucose, levulose, maltose, galactose and saccharose, does not ferment lactose, mannite, dulcite, dextrin, raffinose, arabinose, adonite, inulin, sorbite.

Origin and Remarks.—Found in the stools of a case of sprue. This species is the most frequently met with in Ceylon, in cases of bronchomycosis.

Monilia (?) rotundata, Cast. 1911.—Growth on glucose agar has a somewhat crinkled appearance. The colour is yellowish. Milk is rendered strongly acid and clotted. Serum and gelatine are not liquefied. This fungus does not produce gas in any sugar (glucose, levulose, galactose, saccharose, lactose, mannite, dulcite, dextrin, raffinose, arabinose, adonite, inulin, sorbite); it produces acidity in glucose, levulose, maltose, galactose, lactose.

Origin.—Isolated by me from stools of a case of sprue, a case of enteric, and a case of simple enteritis.

Monilia asteroides, Cast. 1914.—The colonies on glucose agar have a characteristic, radiating appearance (see photo); hence its name. This fungus does not clot milk, grows very badly or not at all on serum, which is never liquefied. Does not produce gas in any of the sugars used, but produces acidity in levulose, saccharose, glucose, maltose, mannite, galactose, lactose, raffinose, dextrin, sorbite.

Origin.—This fungus has been isolated from the stools of a case of sprue, also from one of those peculiar cases of pseudo-sprue I have described, which seem to be in reality chronic infections due to a Flexner-like bacillus.

Remarks.—It is doubtful whether it is botanically correct to place this species and *M. rotundata* in the genus *Monilia.* They possibly belong to different genera, but further researches are necessary on this point.

Conclusions.

(1) In practically every case of sprue it is possible to put in evidence fungi, microscopically or culturally.

(2) These fungi do not all belong to the same species —the so-called "thrush fungus" or *M. albicans,* as stated by Kohlbrugge and all other observers who have confirmed his findings.

(3) As I have stated since several years, there is a plurality of species of such fungi, and the term *M. albicans* has been used in the past to cover a large number of different species and possibly different genera, in the same manner as in the past the term *Tricophyton tonsurans* was used to cover a great number of different fungi. As a matter of fact, *M. albicans, sensu stricto* (*M. albicans*, Robin 1853, em. Cast. 1909) has never been observed by me in sprue cases, as none of the monilias isolated by me in sprue liquefies gelatine.

(4) The following, probably good species, have been isolated from the stools or scrapings of tongue and saliva of sprue patients: *M. intestinalis*, Cast. 1911, *M. fæcalis*, Cast. 1911, *M. tropicalis*, Cast. 1909, *M. decolorans*, Cast. and Low 1913, *M. rotundata*, Cast. 1911, *M. asteroides*, Cast. 1914. The last two species of fungi may in reality belong to different genera. The same case may occasionally harbour two or more different species. *M. intestinalis* and *M. decolorans* have been found in sprue cases: the other species have been found in several other conditions besides sprue.

BERIBERI IN PAPUA (BRITISH NEW GUINEA).

By W. M. Strong, M.D., B.C., D.T.M. H.Camb.
Late Acting Chief Medical Officer, Papua.

THE following account of beriberi in Papua has been written at the invitation of Dr. Sandwith and Mr. Cantlie, of the London School of Tropical Medicine. I must thank them for the encouragement they have given me by expressing an opinion that it was my duty to make known my experience of beriberi during ten years' residence in Papua.

Papua is an extensive island lying just south of the equator to the north of Australia. The British own about a quarter of the island with an area of some 80,000 square miles, a native population estimated at about a quarter of a million, and a European population of about twelve hundred. Papua is perhaps the wildest and least known part of the world.

With few exceptions, which will be mentioned later, beriberi only occurs in Papua among natives who are fed on European articles of diet, and who are not able to vary this on their own initiative. Such cases of beriberi are found either among the prisoners in Port Moresby gaol or among natives indentured to Europeans as labourers. The native living in his village and feeding on bananas, sweet potatoes, yams or taro, with very little proteid food, does not get beriberi.

The ration scale which such prisoners and labourers receive has varied slightly from time to time; but it has never differed much from the following per week: Rice, 10½ lb.; biscuits, ½ lb.; sugar, ½ lb.; tinned meat, 1 lb.

An attempt is usually made to replace some of this rice by fresh vegetables. In Port Moresby and elsewhere, however, these are difficult to obtain for the greater part of the year, and the medical officer has to exert a good deal of pressure in the matter.

It may be mentioned that natives living on such a diet are liable to attacks of "sore mouth" from time to time. In the mildest cases there is only a little ulceration around the teeth. In more severe cases the teeth become loose and stomatitis develops, perhaps with extensive slough formation extending on to the cheeks. I have heard of even more severe cases terminating fatally with sloughing of the face, resembling "noma."

The condition is readily cured by a simple mouth wash, and fresh vegetable food or lime juice. I believe infection can be carried by means of eating utensils, and the pipes the natives use for smoking and which they readily pass from one to the other, but there is probably an element of scurvy in the condition. And scurvy like beriberi is due to the deficiency of a special substance in the diet. This condition is not found among village natives or other natives living mainly on fresh vegetable food.

It is worth noting that the armed native constabulary are not affected with beriberi. The ration scale of the constabulary consists per week of: Rice, 7 lb.; biscuits, 3 lb.; sugar, 1 lb.; meat, 2 to 3 lb.

They also get a small quantity of tea and are always able to purchase small amounts of other food. The indentured labourer gets all his pay in a lump sum at the end of his time and has not got this facility.

At the end of 1912 I had occasion to inspect the native population from Kerema in the Papuan Gulf as far as the western side of the Purari delta. It struck me as very remarkable that while cases of paralysis are extremely rare in the native villages, yet several cases of atrophic non-spastic paralysis were seen in the Purari delta. The disease affected the legs and obviously suggested old cases of beriberi. Assuming that these were cases of beriberi, the question arises as to why this particular group of natives should be affected. I entirely accept the modern view that beriberi is due to a deficiency of a special substance (vitamine) in the diet. The Purari natives live in a swampy delta where there is practically no dry land, they hardly make any gardens for the cultivation of vegetables and live almost entirely on sago. May it not therefore be that sago is also deficient in this anti-beriberi vitamine, and that the cases I saw were actually old beriberi cases. I am familiar with the greater part of the country and know that paralysis is rare elsewhere.*

Two cases which occurred in the Port Moresby native village early in 1913, while I was acting chief medical officer there, are worth noting. I have known the Port Moresby natives on and off since 1903;

* I am aware that several cases of paralysis have been reported by laymen from the Western Division where sago is also largely eaten, but am not myself familar with this part of the country. Perhaps beriberi appears also in the Western Division; it undoubtedly occurs among the pearling fleet in Jones Straits. Natives from the Western Division of Papua have for many years been employed in the pearl fishing. So these cases of paralysis may only be old beriberi from the pearl fishery. On the other hand, the western division is swampy and much sago is eaten there.

but until 1913 had never seen a suspicious case of beriberi. In 1903, these natives lived partly on vegetable food they grew themselves and partly on sago obtained by trading with Gulf natives. Now the European settlement has so much increased that native gardens are almost given up and the natives live largely on sago and rice, with such other extras as they can procure. Early in 1913, at a time when native vegetable food was most scarce and sago common, two cases of beriberi came to me from the Port Moresby village. Again it appears that beriberi can occur on a diet consisting largely of sago.

Having considered the etiology of beriberi in Papua, I now propose to discuss its clinical aspect.

From 1903 to 1905 a series of cases occurred in the Port Moresby gaol of a very uniform and severe character. A prisoner would not seem quite well one evening and not eat his evening meal of rice. Next morning he would be reported to me as seriously ill. I would find him prostrated and unable to rise. His pulse would be either absent or barely perceptible. The heart-beat would be nearly normal in rate, but very feeble with the two sounds similar in character and with an equal interval between the two sounds. Death usually took place within twenty-four hours and was never delayed seventy-two hours. Œdema did not occur. At that time I regarded beriberi as essentially a chronic disease, and was very doubtful if the above were really beriberi. Now I rather regard the cases of beriberi usually seen, not as true beriberi, but as rather the residual permanent paralyses caused by past beriberi damaging more or less unimportant nerves (unimportant as far as life is concerned) beyond recovery. I remember one typical series of nine cases of the above-mentioned acute type all occurring within a few months of each other.

At this time there was no attempt made to supply the prisoners with either fresh vegetables or lime juice. The general line of treatment was the giving of cardiac stimulants, strychnine, alcohol and digitalis. About 1905 or 1906 attempts to supply native food were made, and since then such acute cases have been very rare. In 1911 a native, working on a recruiting vessel, was brought to me with acute symptoms much as described above. The food deficiency (vitamine) theory had just come out, and I at once fed him on unsweetened tinned milk, bread, and minced tinned meat (the only available). Alcohol was also given. I hardly expected him to live through the first night; but he did, and left me a few days after with nothing wrong with him beyond some paralysis of the legs. A few days after a medical man reported him to me as being apparently quite well. I cannot help thinking that here was a case in which the cardiac nerves were seriously involved, but not permanently injured, and that recovery took place as soon as the requisite vitamine was supplied in the milk, &c.

From 1903 to 1906 other cases in the Port Moresby gaol of not quite such an acute character also appeared. In these cases pains in the lower limbs and abdomen, paralysis of the legs, and abdominal symptoms, such as dilated stomach, hiccough, and vomiting occurred. The abdominal cases tended to die in a few days, while those mainly with leg symptoms generally recovered eventually, sometimes with permanent partial paralysis. A *post-mortem* examination on one case showed nothing abnormal except a little excess of pericardial fluid.

I have laid stress on these acute cases, not because the bulk of those seen have been of this character, but because of the clinical importance of this severe type. Ordinary cases with some increase in heart-rate, some paralysis of legs, and loss of knee-jerks were not uncommon. I remember a batch of nine natives coming into Port Moresby, and eight of them going down with this mild type of beriberi.

Since 1906 attention has been paid to native diets, and now everyone makes some effort to secure native food for labourers and prisoners. These acute cases have become very rare, and nothing of the nature of an epidemic has been reported.

But cases of moderate severity occur from time to time. I have noticed in sporadic cases, among a group of natives, that other members of the group will be found with a pulse-rate of about 100, but with no other sign or any complaint of ill-health.*

Other cases occur from time to time with a rapid pulse combined with some vague complaint of ill-health, or perhaps with a complaint from the employer that the native will not work. I remember one case especially. I was visiting a plantation when the manager complained that two of his labourers persistently refused to work properly. They both appeared quite well, except that one had a pulse-rate just over 100 and the other 96. I diagnosed beriberi and advised appropriate treatment with native food, &c., but doubt if the manager was convinced. I learnt afterwards that one native died suddenly about a fortnight after, with no other sign of ill-health. This must have been an instance of chronic involvement of the cardiac nerves with some more acute involvement later.

If one reads the text-books on beriberi the impression is acquired that the number of so-called "wet" cases which occur are at least comparable in number with the atrophic "dry" form. Such has not been my experience in New Guinea. Any sign of œdema is very rare, while I can only remember one typical case of the "wet" form with marked œdema.

In New Guinea multiple peripheral neuritis following an attack of bacillary dysentery has not been very uncommon. The vitamine theory readily explains this. If an individual is just on the borderline of vitamine equilibrium, is it not likely that a disease like bacillary dysentery, where absorption of all nutriment is almost suspended for a while, may cause this vitamine equilibrium to be upset with symptoms of beriberi. If the individual is only absorbing just the requisite amount of vitamine, when digestion and absorption are going on normally, is it not likely that any serious disturbance of digestion may precipitate an attack?

* I mean, of course, a permanent pulse-rate of 100 not caused by recent work or running.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 15, 1914.

SCARCITY OF FOOD IN WAR.

THAT a scarcity of food in Europe is probable at no distant date in some of those countries now at war, in which importation of supplies must become a necessity, is evident to everyone. The harvest in France and Germany has been partly lost from want of the necessary complement of labourers, and as both countries have previously to 1914 been importing grain, that is, in times of peace, there would seem to be, in Germany and Austria at any rate, a certainty that food must become scarce as the quantity of home-produced wheat, barley, oats and rye gives out. In France and Britain, with a sea-board kept open by the British fleets, there is less danger of shortage; and in that great granary of cereals, Russia, there is no possibility of famine for the time being. There is not, and cannot be, any substitute for the ingredients of cereals; many things have been tried, but they are mere adulterations, and therefore, if not actually dangerous to life, valueless as a food. Sawdust has been foolishly upheld as of nutrient value and introduced into bread; beans, peas and lentils have been added with more justification, although they are better used separately, and not intermixed with flour, as yeast has little or no effect upon starch in a form such as it is met with in such cereals. Potatoes are frequently mixed with flour in bread-making, but in times of scarcity an excess is apt to be added, to the detriment of the digestive qualities of the loaf.

Meat is the staple form of food for the European soldier, and beef engenders the highest quality of sustenance. In Britain the beef of the fully matured animal is used as a rule; on the Continent of Europe, however, immature meat in the form of veal is more commonly eaten. If in times of peace slaughtering calves is the rule, so much more in war will this prevail, for it takes two years at least for the calf to reach maturity, and when the land is desolated or the crops ungathered food for cattle is scarce and the calf is killed after a few months of life. The economic fallacy of this is patent at all times, but necessity drives in war, and at the present moment in Central and Western Europe there is a possibility of beef and veal becoming more and more difficult to obtain, for both old and young cattle are sacrificed to fill the necessity of feeding the millions of men engaged in war. The Germans, following their custom in time of peace of eating horse-flesh, will find plenty of meat of a kind on their battlefields to satisfy their appetites, but the nutrient value of horse-flesh is not of the high quality of well-fed oxen, and whilst the stomach may be filled the sustenance is inferior. This is due largely to the difficulty of the human stomach digesting the tough rump steaks cut from the war horse, and partly to the "unhung" state of the flesh obtained, for the horse will be eaten immediately after it is killed. The effect of any tough meat in producing indigestion, cramps, diarrhœa and colitis soon becomes apparent, and an army's strength and powers of endurance are thereby lessened. Some one has suggested that the consumption of horse-flesh accounts for the barbarity of the German soldier, but whilst this advanced physiological reasoning is interesting the idea is calculated to provoke derision. Yet the cannibal says he finds vigour and ferocity from eating the heart of his enemy, a theory which is supported by modern organo-therapy, inasmuch as for a diseased organ the healthy organ of another animal is prescribed, a form of treatment stamped with high scientific authority.

Alcohol is condemned by all military authorities as being deleterious to the soldier, and with good reason. Spirits on an empty stomach and in the semi-starving state soldiers often are in is fatal to a degree to good work. It is interesting to note that the Germans search the cellars of all captured towns for champagne, and consume it freely when it is found.

The instinctive selection of this beverage above all others is due to the saccharine properties of champagne and to the instantaneous vigour it imparts. Sugar is the best and most speedily acting restorative known, and in champagne we have it in a pleasant form; moreover, the German wisely prefers the sweet champagnes to the "dry" doctored and poisonous variety preferred in England.

Cheese is the form of food, both theoretically and practically, best adapted for war rations, and a relieving force which can throw cheeses over the heads of the containing force to their friends inside the beleaguered city will convey a benefit impossible to be surpassed short of raising the siege. It sounds fantastic to suggest that Dutch cheeses might be dropped from aeroplanes or dirigibles into a besieged city, but than cheese no other form of food is so well suited to the idea. Other forms of food, however, could be so conveyed, such as tins of meat, &c., for if bombs can be thus distributed so can foods.

The scarcity of food in an army is answerable for illnesses of many kinds. The ill-nourished body, fatigued with long fighting, lying out on damp ground, occupation of trenches, and all the trying conditions of warfare, with mud in plenty, lowers the resisting powers and paves the way for infectious ailments of all kinds. Cholera in an army, in addition to the insanitary conditions which obtain, attacks the ill fed and fatigued to a degree in excess of anything met with in ordinary outbreaks of this disease. Dysentery, or, rather, acute colitis, which is often the dysentery of camps and armies, is due to the damp, chills, and fatigue acting upon insufficiently fed soldiers. The evils of impure water it is needless to dilate upon, and the supply to armies, especially when advancing over the ground evacuated by the enemy, is invariably in danger of pollution.

The training in times of peace of the Royal Army Medical Corps is apt to be rendered futile in war, yet is that training necessary so that the ideal may be kept in view although it be impossible of attainment. It is the same in all training in peace for war for every branch of the service. The Chamberland or Berkefeld filters, the water-carts, the apparatus for boiling and cooling water, &c., are apt to appear as toys of sanitation when the stress of war brings millions of men into the field. Yet is it well that these should be practised and explained to the soldier, for he thereby has an ideal set before him, which according to his environment will no doubt have to be modified or set aside, but yet is he imbued with the idea of the dangers of impure water and does his best to avoid them under the most adverse circumstances.

The bulk occupied by food is a great consideration in war; the cereals being more bulky than meat accounts for the preference for the latter on the part of the commissariat corps of an army. It is more difficult to feed an army with oatmeal, flour or rice, owing to the bulk these cereals occupy, than when meat is supplied, owing to the concentrated nature of the nourishment it presents.

A British regiment can do with fewer wagons to carry its food than an Indian regiment, with whom rice is the staple diet. This is a consideration of prime importance; but the European regiment requires many other accessories that the Indian soldier does without, and if the latter's actual food occupies more bulk the absence of other impedimenta renders his train of supplies always smaller in consequence.

Biscuits seem to be the ultimate resort of most soldiers short of food, but whilst they are useful to maintain life they are not calculated to give the verve and *élan* which is the prerogative of an army with whom meat enters largely into the diet.

Annotations.

The Supply of Milk to Indian Cities.—H. H. Mann (*The Agricultural Journal of India*, Calcutta, ix, pt. 2, pp. 160-177,), gives an account of the milk supply of Poona. Milk is produced in 47 villages which send in about 550 gallons per day: 21 per cent. comes from villages within a radius of less than 3 miles; 48 per cent. comes from villages within a radius of 3 to 6 miles; 28·5 per cent. comes from villages within a radius of 6 to 9 miles; 2·5 per cent. comes from villages within a radius of over 9 miles.

The supply is brought in by hand in brass pots slung over the shoulders or carried on the heads of the milkmen, bullock carts or the train being only used in a few cases. Nine-tenths of the total consists of buffaloes' milk, whose content of fat and solids-non-fat amounts to 5 and 9 per cent. respectively, as against 3½ to 8½ per cent. in cows' milk.

Of 51 samples only 10 were pure, even when judged on a very conservative basis, the remainder being adulterated with more than 10 per cent. of water. The price varies with the quality, there being a close connection between the price and the amount of water added; for instance, all milk sold at less than six seers for one rupee (1s. 1d. per gallon) is almost certain to be adulterated. With regard to the amount of dirt it contains, this is not nearly so great as would be expected; of the 51 above samples —

56·7 per cent. were clean or nearly clean.
33·3 ,, ,, fairly clean.
7·8 ,, ,, distinctly dirty.
1·9 ,, ,, very dirty.

The milk produced in the city itself is a far more important contribution to the total supplies than that brought in from the surrounding country. The milking cattle of the city consist of 2,688 head, of which 1,532, or 57 per cent., are kept for private use only, and 1,156, or 43 per cent., for sale of the milk. Among the former class about three-quarters consist of cows and the remainder of buffaloes, while in the latter class the proportions are reversed. The cattle kept for the sale of their milk are housed in small sheds distributed all over the city; 80 per cent. of these sheds contain less than ten animals, and their general conditions of hygiene are very bad. It is estimated that about 2,000 gallons are produced daily, of which

about 1,400 gallons are buffaloes' milk and the rest cows' milk; the total daily consumption in the city, therefore, amounts to 2,550 gallons per day.

Ascaris in Pyopneumothorax. — R. Blanchard (*Bulletin de l'Académie de Médicine*, Nos. 26 to 28) describes the case of a robust countrywoman suddenly attacked with pleuritic pain; on puncture fœtid pus was obtained. A purge caused the evacuation of two worms. As pus continued to be discharged the pleura was opened, and a macerated ascaris found. Perfect recovery indicates that there was no opening from the lung. This is the eighth case recorded.

Thread-worms and Appendicitis.—Aschoff (*Berliner klin. Woch.*, August 10, 1914) considers it unproven that oxyuris cause appendicitis. The part they play in causing pseudo-appendicitis showed the necessity of attention being paid to them when children have attacks resembling appendicitis; unless they are removed symptoms may recur even after the removal of the appendix.

Abstracts.

SEGREGATION AND KALA-AZAR.

By W. McCombie Young.

During the years when kala-azar was epidemic in the adjoining district of Nowgong, the Golaghat sub-division escaped invasion, presumably owing to its separation from the adjoining infected district by the barrier to free communication which the interposition between these two districts of the Mikir Hills presents and possibly also by the action of the district officials in refusing admission to infected families migrating from Nowgong during the epidemic there. Six years afterwards, in 1909, attention was directed to the occurrence of the disease in active form in certain villages of the subdivision.

The outbreak was, in the first place, investigated and verified by the provincial sanitary department. The disease was probably imported from Nowgong, and round these original foci of imported disease other cases had appeared. The history of the disease showed extraordinary infectivity, and member after member of an infected family became infected and died. The disease had a well-defined tendency to cling to certain groups of houses and to spread from them into surrounding areas. It was not showing any decided tendency to advance, but so long as these foci exist it would be impossible to say when the disease might not assume epidemic form, and it would be unwise to rely, in our ignorance as to the transmission of the disease, upon conditions possibly not being so favourable to the spread of kala-azar as in Nowgong. In view of the caution originally enjoined upon the public health administration of Assam, lest the disease should gain an active footing in the economically important districts of the Upper Assam Valley, it was decided to put measures of control in force. As a preliminary to these a house-to-house survey of the whole subdivision was carried out in detail.

When the number of infected villages, houses, and persons had been ascertained in this manner, segregation measures were put in force:

These consisted in supplying the infected family with a new house, at Government expense, upon a new site at a minimum distance of 50 yards from the old site, and in most cases at a greater distance.

As no separate isolation hospital for the reception of sick persons was in existence, nor indeed would popular opinion have consented to its utilization had it been available, in many cases it was found necessary to remove the infected member of the family along with the uninfected persons to the new site. In such cases a separate sleeping apartment outside the house enclosure was provided and the adults of the family were cautioned to prevent the infected persons from sleeping or eating with others.

On evacuation of the house in which infection had occurred it was burnt down, and with it all bedding, clothing, and other belongings which could presumably harbour insect parasites were destroyed under the supervision of an assistant surgeon on special duty for the purpose. Liberal compensation was paid by Government for property so destroyed.

Since the commencement of these operations the work has been continuously supervised by the sanitary department and notes as to the condition and health of all infected or suspected families have been recorded monthly.

Out of forty infected families removed to new sites three years ago a recurrence of the disease in a person not obviously infected upon the old site has occurred in only one case.

The people appear to recognize the value of the measures, and are grateful to Government for carrying them out.

Provided that no new and separate foci of the disease appear, it is possible that the disease may be extinct in this subdivision in a few years' time if these measures of control are continued.

These results are perhaps worth recording for the following reasons:—

(1) They appear to show the possibility of applying with success the same measures of segregation to the indigenous population as have proved of value in combating the disease among the labour force of a tea garden.

(2) They show that measures of removal and segregation which, on *primâ facie* evidence, seemed to be most incomplete, in that they involved the removal of an infected person to the new site, have been attended with an unexpected degree of success.

It appears that whatever complicated processes of disease transmission are covered by the convenient phrase "site infection," nevertheless it appears to play an important part in the propagation of the disease.

Whether the diminution of the disease is due to our operations, or is in reality due to a natural decrease in the course of the waxing and waning of the activities of an endemic disease, it is difficult to decide, but the fact that the disease is tending to increase rather than to diminish in the adjoining district of Nowgong, as will be seen from the

subjoined figures, to some extent confirms our belief in the usefulness of these measures.

	1909	1910	1911	1912	1913
Kala-azar mortality in Nowgong	140	221	286	308	417

In conclusion, it is not suggested that these operations have been wide enough in scope or long enough in duration to afford much evidence as to the vexed question of the transmission of the disease. The object of this note is to draw further attention to the apparent usefulness as a public health measure of the removal of kala-azar infected families to new houses on uninfected sites.—*Indian Medical Gazette*, August, 1914.

TSETSE-FLY AND BIG GAME IN SOUTHERN RHODESIA.*

By Rupert W. Jack.

In Southern Rhodesia conditions are better than in most other parts of Africa for gathering information concerning the distribution of tsetse in the past, and perhaps even in the present. This is due to a combination of two factors, namely, that only one species of tsetse, *Glossina morsitans*, is found within our borders, and that the territory, in comparison with the Central African States, contains and has contained a relatively large European population.

The case built up is considered strongly in favour of a vital association between the prevalence of big game and the continuance and increase of the fly.

In most cases game is more or less abundant all the year round in fly-infested country, and that in no instance is the larger animal life altogether absent, even during a portion of the year. The point where the writer carried out certain investigations on the Gorai River is fifteen miles away from the Hanyani, the nearest water at the end of the dry season. The grass is burnt off annually by the natives, and the game naturally forsakes country which contains neither grass nor water. Along the banks of the Gorai, nevertheless, fly is abundant in October and November, whilst on the west bank of the Hanyani, where the game is normally abundant at this time of year, fly is scarce. This appears at first sight a strong argument for the dissociation of tsetse and big game, but closer investigation of the situation reveals the presence of other factors.

In the first place, the situation as seen in October and November is only temporary, being due to the drying up of the rivers and the burning of the grass. In the second place, although at the time of the visit the larger antelopes had all deserted this part of the country, there were left behind warthog, undoubtedly capable of yielding sustenance to tsetse. Shot specimens are frequently found abundantly attended by the fly, and trypanosomes have been found in warthog blood. These animals either have the power of burrowing down to water where other animals would have to thirst, or are constitutionally to a large extent independent of drinking, because they are, like the duiker, met with in very dry tracts of country where none of the larger antelopes are to be found. Along the Gorai River, in November, 1911, the writer saw several herds of warthog, and one herd was lying on the very river bank in the shade where the tsetse congregate, and was probably affording a meal to numerous tsetse at the time. There was also evidence of much rooting in the vicinity of the river where the ground is soft and succulent roots are more abundant than in the neighbouring bush. In the third place, the fact of the tsetse not being found associated with the game at the Hanyani River is probably accounted for by the nature of the country. Along the Hanyani where the game was congregated the banks of the river are very thickly wooded and there is very much dense undergrowth, whilst this condition gives way to country in which shade is very deficient. Now shade is essential to tsetse, but *G. morsitans* is not, in the writer's experience, found in abundance in this territory in any bush so tangled as to be difficult of penetration. In addition to this, the neighbouring forest is unusually open, not affording much shade even in the wet season when tsetse spreads through the bush instead of remaining confined to the shady banks of watercourses and edges of vleis. The Gorai River affords excellent winter shade, and the surrounding bush is sufficiently shaded during the rains, so that it is in all respects suitable for tsetse, and it is not a matter for wonder that the fly has increased and made its home in this part, whilst it has failed to do so to the same extent on that part of the Hanyani River to which reference has been made. In April, 1911, the writer again visited the neighbourhood of the Gorai River and found that game, including rhinoceros, zebra, sable, kudu, eland, impala, &c., was moderately abundant in the haunts of the tsetse, which was at that time to be met with throughout the bush.

The evidence in favour of the necessity of big game to the tsetse in Southern Rhodesia and adjacent territory may be summed up under four heads:—

(1) Tsetse retired before the advance of civilization in the Transvaal, the only known modification of conditions being the destruction of the game.

(2) Tsetse disappeared from large tracts of country immediately after the rinderpest in 1896.

(3) Tsetse has increased and spread since the rinderpest only in those parts of Southern Rhodesia where big game has increased.

(4) Tsetse has greatly decreased of late years in the Hartley district in those parts where the big game has been most effectively destroyed or driven away.

(1) Sufficient weight has hardly been attached to the phenomenon of the retirement of the tsetse before the advance of the white man, for in conjunction with subsequent events in this territory and elsewhere, this is one of the most weighty arguments for the vital association of the fly with big game. The advance of settlement was preceded by the wholesale destruction and driving away of the larger fauna of the forest, *and for many years this was the sole modification of natural conditions due to the advent of the*

* Reprinted from the *Bulletin of Entomological Research*, September, 1914.

European. The only attempt at a suggestion of other changes that might conceivably have had an adverse effect on the tsetse appears to be that settlement implies a certain amount of clearing of the forest; but it is quite obvious that settlement did not penetrate into fly-infested country, but pushed the pest back before it: that is to say, that farms were not worked "in the fly," for very natural reasons, and that therefore, as a general rule, no clearing of any extent occurred in the forest until the fly had practically disappeared from it. As a matter of fact, but little clearing usually occurs on pioneer farms in South Africa for many years after occupation, unless the farmer happens to be a man of considerable substance and enterprise, bent on developing his farm agriculturally, attributes hardly characteristic of the voor-trekkers in the Transvaal, who were primarily stock-owners.

(2) The total disappearance of the fly from some parts of Africa and its great reduction in others after destruction of the bulk of the game by rinderpest is, of course, a very strong argument for the dependence of the fly on game. There is no tsetse now in districts in which it used to occur in varying abundance, according to the reports of early hunters and traders. In other areas a nucleus of the pest was left, but large tracts of country were free which are infested at the present time. The path by which the cattle are brought down crosses the Zambesi at Feira and the Hanyani River about six miles below the escarpment. It was between that river and the escarpment that the fly appeared. According to native testimony, however, tsetse existed earlier than this to the east, about the Gorai River already mentioned, but very definite information is lacking. After 1902 the spread of the pest was rapid, and by 1905 at least it extended as far north as the junction of the Ambi River with the Hanyani.

The Lomagundi district has some special features of its own. The available information concerning this district before 1900 is more meagre than in regard to any other. There appears to be no record of tsetse at that time, but it was fairly numerous there in 1903. It is probable, therefore, that a nucleus of fly remained in this part after the rinderpest. The writer has received indirect native testimony to the effect that tsetse never died out altogether. Whether fly was present below the escarpment to the north-west of the district at that time can only be conjectured. There is no doubt, however, that that belt has extended very greatly of recent years. Between 1905 and 1910 odd specimens of fly were encountered at a number of isolated spots in this area. Subsequent visitors have almost always failed to find fly at any of these spots.

This part of the country has been shot over to a considerable extent by hunters and prospectors, but the game has certainly not been reduced to anything like the same extent as it has in the Suri-suri belt in the Hartley district. It would seem that the fly in this part survived the rinderpest in very small numbers in scattered localities, failed to increase to any extent, but persisted until recent years, although on the verge of extermination. Concerning the factors controlling the situation we are altogether ignorant.

In the Sebungwe district a belt always existed along the Umniati River, which has, however, only extended to its present limits within recent years. The writer has personally noted a southward extension of about seven miles since November, 1910, and according to the testimony of white hunters and natives there has been a considerable progression to the north and west.

Owing to the native disturbances and other troubles which affected Southern Rhodesia in 1896-7 and the undeveloped state of the country, exact information concerning the distribution of tsetse between that time and the year 1900 cannot be expected.

Our information concerning the spread of tsetse in the Sebungwe district is more detailed than it is in regard to other parts. Tsetse was first taken on the Sengwa in that year, at the junction with the above-mentioned river, and the writer fixed the southern boundary in May. The southward movement of the fly had been very rapid, and had driven away the only native chief possessing cattle in the district. This native subsequently moved his cattle back to his old kraal and lost very heavily from trypanosomiasis, whilst some Government mules stationed at a kraal within three miles of the same spot also died about the same time. The fly is very thick at one spot close to the Sengwa in this belt.

The Sebungwe area is of special interest because there have been no white men living in the district to the west of the Sengwa River, the natives are practically unarmed, and the processes of nature have not been interfered with by human agency. Big game has increased greatly and is now very abundant in certain parts.

Turning now to the Hartley district we are confronted with an exactly opposite situation. Here human agency has been at work for years and natural conditions have been modified. The heart of the fly-belt on the railway line, which is the one to which it is desired to call particular attention, is about the head-waters of the tributaries of the Suri-suri River. There is, unfortunately, but little to be learnt from a comparison between the extent of the belt after 1896 and its extent to-day, because it is nearly surrounded by mines, and although the heart of the belt was, up to 1912, still virgin forest, the bush had been cut down to supply fuel and timber to a considerable extent around it, and conclusions, therefore, cannot be drawn from the fact that the fly has not spread widely in the district. It may, perhaps, be worth noting that, in spite of the facts mentioned above, there have always been channels some miles in breadth along which the pest might have spread without encountering any modification of its native habitat beyond the scarcity of game. On the whole, however, it seems best to leave this side of the matter out of the question. It should, moreover, be noted that owing to the large number of cattle used for transport on the mines and farms, our information concerning the range of the pest in these parts is exceedingly good. In spite of farming and mining operations,

however, there was, until early last year (1913), an area about 150 square miles in extent in which the only change from natural conditions due to human agency had been the destruction and driving away of the game. During the past few months a light railway has been run down to the heart of the belt to supply timber for certain mines, and, according to information received, the destruction of the forest has been very considerable. Events subsequent to 1913, therefore, have no bearing on the question of fly and game.

An area embracing the fly-belts in the Hartley district was first thrown open to free shooting for three months in the year 1901, but this period was not extended. Later, in 1905, the Game Laws were again suspended in respect to this part of the country, zebra, elephant, rhinoceros, hippopotamus and ostrich being excluded, however, from the scope of the notice. The open area was maintained until 1908, but in that year was closed again, only to be reopened in 1909 on account of heavy losses amongst cattle. Since that time the Game Laws have remained suspended with respect to the fly-infested portion of the district.

The basin of the Suri-suri River, being easy of access, was shot over to a great extent by residents in the district, as well as by professional hunters, and between 1905 and 1908 a considerable reduction of the game took place. But even in 1909 there were still small herds of eland, sable, zebra and other buck to be met with. The destruction has continued since then, and at the present time the basin of the river, once one of the more prolific hunting grounds in the territory, is almost destitute of the larger fauna, although until last year a few still lingered, and small herds were liable to pass through at certain seasons. A few warthog and small buck were usually to be found. The writer visited this part first in August, 1909, and there was considerably more evidence of big game at that time than in the years following.

The last instance of tsetse having been met with in considerable numbers in the Suri-suri belt occurred in 1908, when they were sufficiently thick to constitute a serious personal nuisance: the fly was more numerous previous to 1909 than afterwards. In 1910, a Cape boy who drove the writer across the Suri-suri River near its head-waters volunteered the statement that a few years previously the mules would have been attacked by a swarm of tsetse. The very considerable losses of cattle from trypanosomiasis at the end of 1908 and the beginning of 1909 were largely the cause of the area being again thrown open to free shooting in March of the latter year.

The writer paid almost monthly visits to the Suri-suri belt after August, 1909, and throughout 1910, and never on any occasion met with the pest in numbers. The greatest number seen in one day was in October, 1909, when the total was nine. Usually two or three were encountered, and occasionally none at all. The belt has been kept under observation since, and there has been no sign of increase. Losses from trypanosomiasis in cattle have decreased in this part of the district; in fact, until a contractor, persumably emboldened by the general immunity, actually kept and worked his spans in the very heart of the fly-belt, they had nearly ceased, and cattle are now kept and worked where it would have been fatal to have done so formerly. Tsetse has not, however, altogether disappeared. The cases of trypanosomiasis amongst the cattle working in the heart of the old fly-belt indicate that a few tsetse are still to be met with. The presence of cattle in the former haunts of the game, where fly still persists in very small numbers, might conceivably have even caused a small increase of the pest since last year, though the clearing of the bush would eventually counteract any tendency of this nature.

The lingering of the fly does not, of course, affect the broad facts of the situation, seeing that the game had not been altogether destroyed. The important fact is that in this district alone in Southern Rhodesia has tsetse decidedly decreased of late years, and here the game has been greatly reduced by artificial means. In other districts where permanent fly-belts occur the game has become more abundant and the fly has increased and extended its range greatly since 1896. It is interesting also to note that the greatest and most rapid extension has occurred in those parts of the territory where game is most abundant, as in the Sebungwe district and certain parts of the Zambesi Valley.

We have, therefore, south of the Zambesi River a very logical chain of evidence, so far as it goes, suggesting the necessity of big game to the tsetse-fly, namely, the retirement of the fly before civilization under circumstances difficult to dissociate from the effect of game destruction; the general disappearance or great reduction of the fly coincident with the general reduction of the game by rinderpest; the increase and spread of the fly again corresponding with the increase of the game; and, finally, the reduction again of the fly locally coincident with the removal of the game by human agency in that particular spot.

The writer is well aware that something more than these facts will be required before the theory of the vital connection of the two forms of life is accepted, especially as some contradictory evidence has been brought forward elsewhere. On account of the nature of the problem, however, final proof could only be constituted of an accumulation of circumstantial evidence pointing in the same direction, and the Hartley experiment in this territory appears to be the first definite effort to obtain direct evidence on the point. The experiment was not carried out with the scientific detail that would undoubtedly have rendered it more valuable, but nevertheless the result is very significant in conjunction with events elsewhere. At the present time it may be said that nearly all the known facts in South Africa either strongly support the positive theory or are, at any rate, not inconsistent with it. Years before the rinderpest it was the general opinion amongst

hunters that "the fly would disappear with the game." The apparent effect of the rinderpest was confirmatory to an amazing degree, and subsequent events have now lent their support. Even to suggest any other possible explanation of the various phenomena is a matter of difficulty and necessitates an appeal to the possibilities of coincidence that few would care to place upon paper.

Apart from the contradictory reports of different observers, the great obstacle to the acceptance of the theory of the necessity of big game to the tsetse-fly is the fact that many other possible sources of blood than the ungulate mammals exist in the African forests. By a closer examination of the matter, however, it seems probable that the vast bulk of these are not fitted to be relied upon in this respect. Few will contend that there is any possibility of invertebrate animals, such as caterpillars, being a permanent source of nourishment to the tsetse. Amongst the vertebrata it also appears that an exclusive diet of reptilian or amphibian blood, or even a mixed diet of such blood and that of mammals, is deleterious to the species. [The researches referred to concerned *G. palpalis* and not *G. morsitans*; moreover, the later observations indicate that the conclusions cited are probably erroneous, for they have found reptiles to be a highly favoured source of food for *G. palpalis* under natural conditions.—Ed., *Bull. Top. Res.*] As a matter of fact, in the case of *G. morsitans* such a supply is rarely available, as the fly is not often found on the banks of the larger rivers where crocodiles abound, and the belts in the dry season are frequently far removed from water of any sort, in which case water-loving reptiles, such as *Varanus* and freshwater Chelonia, as well as most amphibians, are not available. The smaller lizards, including chameleons, are more likely to make a meal of tsetse than *vice versa*, whilst the terrestrial tortoises are too scarce to be of any account. Amongst the mammals, certain orders, namely the Insectivora, Chiroptera and Edentata, are obviously of no service on account of their nocturnal habits and the seclusion of their diurnal retreats. Certain rodents, such as hares, may serve the fly for a meal on occasions, but the order can be of but little importance on account of the small size and activity of the majority of its members and the fact that they are largely nocturnal in habit. Of the larger species the porcupine (*Hystrix*) is entirely nocturnal, but certain squirrels attain a size not greatly inferior to that of a rabbit and are of diurnal habit. The larger forms of the latter family are, however, rarely seen in country suited to the tsetse. No doubt the larger carnivora are attacked by tsetse when they enter its haunts, but their numbers are relatively so small that they are practically negligible. Lions and, to a lesser extent, hyænas, are also dependent on the larger ungulates for food, and desert country from which these have been driven. The hunting dog (*Lycaon*) is always migratory, and leopards and jackals, in addition to their scarcity, lie up during the day. The smaller carnivora—Felidæ, Viverridæ, Mustelidæ—are also practically nocturnal, and from their alert and active habits are unlikely to submit to be fed upon. Anyone may note the intolerance of the domestic cat to the attentions of *Stomoxys* in this connection. It would seem, therefore, that the whole class of mammalia, with the exception of ungulates and certain primates, are little fitted to be of service to tsetse even in the aggregate. The smaller antelopes and Quadrumana must be considered later. In connection with birds, we are faced with the fact that tsetse certainly shows no dislike to avian blood, as fowls have been freely used to feed the flies (both *G. palpalis* and *G. morsitans*) in confinement, and evidence has been brought forward to show that species of Glossina at least occasionally secure a meal from certain birds in nature. On the other hand, in the case of *G. palpalis*, in the presence of other sources of blood, birds are not laid under contribution to any great extent. Similar observations do not seem to have been made with *G. morsitans*, but it should be noted that this species has little opportunity of feeding upon the quiescent water-loving birds suggested as the source of the avian blood found in *G. palpalis*. Moreover, the tsetse's habit of awaiting its prey not far from the ground renders it probable that the vast majority of birds come comparatively rarely within the ken of the fly. Small birds, also, in addition to their restlessness, activity, and tendency to catch insects, probably have but little power of attracting tsetse, for there is some evidence to show that the size of an animal and the amount of disturbance created in moving about have a direct influence on the number of tsetse attracted, at least in the case of *G. morsitans*. It would, in fact, seem that the distance a tsetse is led by scent alone is a comparatively short one. The writer has frequently had the experience that when sitting quietly in a fly-belt few tsetse would be in attendance, but that a movement of only a few yards brought a considerable accession of numbers, the newcomers showing a desire to bite that proved they were hungry. On the other hand, movement through infested forest invariably attracts a number of the flies, even when it is as soundless as progress along a path on a bicycle. The flies in such circumstances do not always evince a desire to feed, but on the other hand they quite commonly do so. From this it appears that the range of sight is greater than that of scent, and that large moving bodies constitute a particular attraction. If this is the main method by which flies are attracted, the range of attraction of an animal should, within certain limits, vary in direct ratio with its size, and one can understand that, apart from all other considerations, small mammals, small birds, and small reptiles could on this account alone form only a casual source of sustenance. There are, however, certain birds which live almost entirely on the ground, are of sufficient size to attract tsetse from some distance by vision, and are often found in great abundance in the particular haunts of the fly. These comprise several species known as game birds, and include *Numida*, *Pternistes*, *Francolinus* and others. The fact of tsetse feeding on fowls in captivity would seem to show that attempts would be made to feed on other gallinaceous

birds in a state of nature, at least when pressed by hunger. The writer has, nevertheless, found on entering a limited belt where enormous numbers of game birds were congregated, the flies were as eager for mammalian blood as elsewhere, and the collapsed state of the abdomen showed that they had not fed to the full for days. At this spot the birds rose from the grass at almost every step, and if the flies were in the habit of finding the birds and feeding on them there was certainly not the least difficulty in every fly doing so, nor any apparent reason for the presence of swarms of desperately hungry individuals. There is therefore some ground for belief that for some constitutional cause, such as their conformation, their armature of feathers, their activity, their habit of pecking at insects, or such causes combined, birds as a class do not form a very suitable source of sustenance to tsetse. That some such disability exists in respect to most other bloodsucking flies would seem to be beyond question, when we consider how little attention *Stomoxys*, *Hæmatopota*, *Tabanus*, &c., pay to fowls, for instance, even in the absence of larger animals. The only bloodsucking flies that have made a thorough success of feeding on birds appear to be some members of the Hippoboscidæ, which have developed a parasitic habit and become specially adapted to moving about amongst feathers. The flat form of *Olfersia* is obviously of advantage to it in this respect, and we can see how ill-adapted the tsetse is in comparison.

With regard to the smaller antelopes and Quadrumana there is no doubt at all that the fly feeds upon these animals whenever appetite and opportunity coincide, or that a regular supply of the blood of these species would serve the fly indefinitely. The small buck, however, do not run in herds and are very scattered, and on this account are not fitted to afford a regular meal to large quantities of tsetse. It is conceivable that monkeys and baboons, in spite of the great troops of the latter, also fail to some extent in this respect. They are also by no means constant denizens of fly-belts. Dr. R. E. McConnell's observations on the actions of his pet monkeys when attacked by tsetse show that making a meal of monkey's blood is not without danger to the fly itself. In connection with a species to which the prolonged survival of the individual is of such importance as it is for Glossina this may not be without significance.

A feasible explanation of the dependence of *G. morsitans* on the larger Ungulata seems to be that a regular supply of blood is essential to the continuance of the fly, and that this is only afforded by the presence during the greater part of the year of these grass-feeding animals. An irregular supply is afforded by monkeys, baboons, small buck and other animals, and possibly birds, which may help to tide the insect over periods of scarcity. It does not appear to be incomprehensible that a regular supply of food should be of such importance to the species when we recollect the great expenditure of substance of the female in the comparatively slow process of reproduction. The tsetse is obviously very delicately poised in the balance of nature, and any retardation of the rate of reproduction would obviously have a tendency to result in the failure of the species to maintain itself. When food is scarce there is no doubt that reproduction is retarded, and in belts where a season of scarcity occurs annually there will be comparatively few offspring produced during certain seasons of the year. The very few pupæ found by the writer on the thickly infested Gorai River supports this view, especially when compared with the results obtained elsewhere in belts not subjected to annual periods of dearth. During a portion of the time when the flies are congregated in the shade provided by the banks of the watercourses reproduction is apparently very slow, and it must be assumed that the numbers of the tsetse are maintained by the breeding which occurs at other times of the year. Where, by the removal of the main source of food, tsetse is subjected permanently to an irregular supply and also forced to draw this from sources involving some danger to the fly itself, reproduction could quite conceivably fail to keep pace with the death-rate, and the species die out on this account.

The writer would emphasize the fact that no claim is made to have explained in the foregoing pages all the phenomena connected with the disappearance of tsetse-fly. There are far too many factors affecting the situation. The sole object in view has been to point out that the apparent dependence of *G. morsitans* on big game is not quite such an inexplicable phenomenon as it appears to be at first sight. The position of tsetse-fly at the present time, in fact, would suggest some such dependence.

A further experiment in the direction of ascertaining whether the spread of tsetse can be checked by the reduction of big game has now been commenced in the Sebungwe district. A wide belt of country, bounded on one side by the Umniati River and on the other by the Sengwa, has been declared an open area for shooting. The fly is reported to be spreading across this area from the west and east, and it is desired to prevent the two belts meeting and embracing the Bumi and Sesame Rivers where there is a considerable number of native kraals. Observations have been made on the limits and abundance of the testse, and, provided that the suspension of the Game Laws results in the destruction of the big game to a sufficient extent, the experiment should certainly yield valuable information.

It is urged by those who support the theory of a special association between tsetse-fly and buffalo that it was the nearly complete extermination of the buffalo, apart from other game, by the rinderpest that was the cause of the great reduction of fly which immediately followed. If this theory is still tenable, it must now be urged that the increase of fly has been due to the increase of this species of animal, unless, of course, it is suggested that the progeny of the fly that survived the year 1896 have acquired new habits, which would be merely a method of admitting that the theory no longer holds. Whatever may have been the position before the rinderpest—and buffalo blood may have been the most easily obtainable food of tsetse at that time—it is quite certain that in

Southern Rhodesia to-day the fly is not in any way dependent upon this species of animal. Buffalo was at one time, as is well known, extremely abundant in various parts of the territory, but whatever may have been the reason the species has never been protected under the Game Laws, its numbers have not increased since the rinderpest in the same proportion as the various species of antelopes. This may be due to the fact that the reduction of the buffalo was more nearly complete than that of any species of antelope, or to some other cause, but at the present time buffalo is not generally met with throughout the territory. Herds occur in certain parts, but as a species it is distinctly local. Were buffalo of vital importance to tsetse herds would occur in some abundance throughout the fly-infested country; but, as a matter of fact, there are great belts of country infested with fly in which buffalo is rarely or never heard of, as in the greater part of the Sebungwe belt lying west of the Sengwa River, the biggest and most thickly infested fly-area in this territory.

The converse argument is of little importance, but one hears so much about fly following the buffalo that a very striking instance to the contrary may be recorded. Near Nenyunka's kraal on the Sengwa River there is a thick thorn brake, such as is termed isi-ṇanga by the natives, in which buffalo is very abundant, far more so than any other species of game in the vicinity, but tsetse is not to be found. The writer penetrated to the heart of the isi-nanga where the drinking places of the animals were situated and where the quantity of dung made the place look like a cattle kraal, and met with no fly. Nenyunka's kraal is certainly marked on the edge of the fly-area in a recent map of the district, but this was on the strength of one or two having been reported to have been seen by natives. The edge of the belt to the south is, on reliable information, from ten to fourteen miles up the Sengwa from this point, and there is another belt on the lower reaches of the Sengwa, the limits of which have not been clearly defined, but here, in the very haunt of the buffalo, fly is absent.

To sum up the matter rather baldly, it is quite certain that no one having travelled through the fly-belts in Southern Rhodesia, as the writer has done during the past five years, could entertain the idea that, except in a few localities, the blood of the buffalo is, even at long intervals, a regular food for the tsetse, much less that it is an essential one.

Reviews.

PRACTICAL TROPICAL SANITATION. A Manual for Sanitary Inspectors and others interested in the Prevention of Disease in Tropical and Sub-tropical Countries. By W. Alex. Muirhead, Staff-sergeant, R.A.M.C., &c. With illustrations; pp. xv + 288. London: John Murray, Albemarle Street, W. 1914. Price 10s. 6d. net.

This carefully written book practically covers the whole field of tropical sanitary effort, thus filling up a distinct gap in the literature devoted to this subject. It should be of value to the sanitary inspector, more especially when newly appointed, seeing that it gives innumerable details which are often ignored by writers as being of too simple a character to deserve mention. Thus, the singular and plural of certain nouns used in connection with bacteria are given for the benefit of readers unfamiliar with them. The cause of disease is also gone into very thoroughly; the different channels of infection being described with exceptional clearness.

In the chapter on Tropical Diseases the part played by the common house-fly in carrying infection is graphically shown. Malaria is dealt with very fully, and a diagrammatic illustration of the connection between man and mosquito in the spread of malarial fevers is particularly interesting.

Mosquitoes have a chapter to themselves. It seems a regrettable fact that insects, upon the investigation of which the indefatigable resources of science and patience have been brought to bear, should be such an appalling scourge to mankind. Full details of the life-history of a mosquito are given, the complex subject being much elucidated by the illustrations.

Seeing that this book is specially intended for aiding the sanitary inspector, a considerable portion of it is devoted to disinfection, air and ventilation, water and water supplies, food, &c. There is no doubt that if the rules laid down here are adhered to, they should be of material aid in stamping out tropical disease in the near future. A marked feature of the manual is the way in which an attempt is made to simplify complicated technicalities, so that they may be easily comprehended by the layman. In furtherance of this object there is an excellent appendix, which cannot but be of great assistance to any candidate for examination in tropical sanitary work.

Throughout the text there are numerous illustrations, many of which are original, and add considerably to the interest of the reader. The type is good and the book of a size convenient for handling. It can be thoroughly recommended to all anxious to study tropical matters.

OBITER SCRIPTA. Throat, Nose, and Ear. By A. R. Friel, M.A., M.D., General Hospital, Johannesburg. 1914. John Wright and Sons, Ltd., Bristol. Pp. 40. Price 2s. 6d. net.

This little brochure only contains three chapters, dealing respectively with common conditions in the throat, nose, and ear; zinc ionization and the treatment of ozæna, including some notes on Friedländer's pneumobacterium.

The author gives practical advice which would be a help to the student anxious to obtain a rapid and brief survey of conditions and operations pertaining to these branches of surgery. The country practitioner, too, if called upon to resort to drastic measures, might find it of service in an emergency.

The book is neatly bound and the type good; the thinness of the volume being compensated for by the thickness of the paper. There is quite a full index.

Original Communications.

THE METEOROLOGY OF MALARIA.

By MATHEW D. O'CONNELL, M.D.

THE work done by the Department of Sanitation of the Isthmian Canal Commission, under its chief, Colonel William C. Gorgas, of the United States Army, has produced a great improvement in the health of the employees of the Commission and also in that of the general population of the Canal Zone.

In the Annual Report of the Commission for 1912-13, p. 528, the morbidity rate of malaria is taken as an index for health conditions on the Isthmus. The following table gives the admission rate, per 1,000, since 1904, of employees sick with malaria :—

Year	Admissions per 1,000
1904-5	162
1905-6	727
1906-7	287
1907-8	312
1909-10	183
1910-11	202
1911-12	143
1912-13	102

The seasonal incidence of malaria among the employees is indicated in the following table taken from p. 554 of the Annual Report for 1912-13 :—

HOSPITAL CASES OF MALARIA AMONG EMPLOYEES.

Month	Total cases	Number of employees
July	1,037	48,714
August	919	50,305
September	438	50,948
October	301	50,103
November	272	52,539
December	376	53,810
January	499	52,142
February	591	55,333
March	433	56,258
April	234	59,771
May	177	59,771
June	237	58,590

Presumably this admission rate does not include those cases of malaria among the employees which were treated in sick camps, and in quarters. Still, from the figures given in the above table it is seen that the disease still lingers among the employees to some extent.

The great reduction in malaria among the employees has been attributed to the killing of, and protection from, mosquitoes, oiling pools, clearing brush and grass, constructing and maintaining ditches for drainage purposes.

In the Canal Zone during the year 1912-13 no fewer than 1,063,689 mosquitoes (anopheles and culex) were killed in houses and barracks; 5,310 breeding places of mosquitoes were found and oiled; 277 miles of new ditches were constructed, and 272 miles of old ditches maintained, for drainage purposes; 7,356 acres of grass and brush were cleared. But in addition to the above measures for the eradication of malaria, another anti-malarial work of acknowledged benefit has been slowly progressing since the commencement of the making of the canal. I refer to the excavation of the canal itself. For, in addition to its being a canal for shipping purposes, is it not also a huge drain cut right through the middle of the ten-mile wide zone and extending from Ancon to Colon?

Such a drain must have a great effect in drying the soil, and therefore drying the overlying hot atmosphere, for a considerable distance on both sides of it,

In order to ascertain if the atmospheric conditions of the Canal Zone are, at present, such as would afford an explanation of the occurrence of an intermittent pyrexia among the employees I have obtained, by the courtesy of Colonel W. G. Goethals, chairman and chief engineer of the Panama Canal Commission, records of meteorological observations at Ancon (Pacific side), Culebra (Central Station), and Colon (Atlantic side), for periods of forty-eight hours in the months of February and August, 1913. In these records the dry bulb temperature and the relative humidity are given every two hours and the velocity of the wind every hour. From the dry bulb temperature and relative humidity of the air I have added the wet bulb temperature and drying power of the air from Glaisher's Meteorological Tables.

In line with each record at Ancon I have placed, for comparison, the nearest atmospheric conditions which were found by actual observation to raise the body temperature, of many of the weavers in the Lancashire cotton sheds, above normal.

On page 322 are given the atmospheric conditions at Ancon, from 1 o'clock a.m. on August 1 to 12 o'clock midnight on August 2, 1913.

From comparison of the atmospheric conditions at Ancon in August, 1913, with those which raised body temperature above normal in the Lancashire cotton sheds, it is, I think, evident that the former by the greater impediment which they present to loss of heat from the body, especially during the twelve hours of the night, must raise body temperature more than the atmospheric conditions in the Lancashire cotton sheds did, *i.e.*, must cause pyrexia in many; and the meteorological change which takes place from the night to the day must make any pyrexia, so caused, intermittent in type, as I have in previous papers tried to explain.

In the section on Meteorology in the Canal Report for 1912-13 it is stated that during the year the rainfall and relative humidity of the air were generally deficient, whilst the air temperature (dry bulb) and wind movement were above the average (p. 244). Thus there was less impediment than usual to loss of heat from the body by evaporation and by conduction and connection which would make any pyrexia so caused, by the atmospheric conditions, less prevalent than usual.

As regards loss of heat by conduction and connection, it is stated on p. 232 of the Report that the anemometer at Ancon is 69 ft. above the level of the ground and 160 ft. above the sea level.

In less elevated and less exposed parts of Ancon the movement of the air would be proportionally less than at the level of the instrument, and therefore the impediment to loss of heat from the body by

conduction and connection would, in such places, be greater.

In further papers I hope to give the atmospheric condition at Culebra (Central Station), and at Colon on the Atlantic side of the Canal.

A CASE OF *LEISHMANIA TROPICA* WITH A FATAL TERMINATION.

By A. R. Neligan, M.D.Lond., M.R.C.S., D.T.M. & H.Cantab.
Physician to the British Legation, Teheran.

Salek,* the Persian name for *Leishmania tropica* or Oriental sore, is so common at Teheran that natives pay little attention to it, and seldom come for treatment to European medical men except when the ulcer becomes grossly infected with pyogenic organisms. Indeed, apart from the ugly scar which the sore leaves behind, serious results or deformity are not common. The case described below, which died of tetanus and in which no other "port of entry" for the bacillus could be discovered than the sore itself, came then as rather a shock to me. Looking back now on all the cases of *salek* with secondary infection that one has seen, for such a complication as tetanus to occur would appear to be the simplest thing in the world. As a matter of fact, this is the first case of the kind with which I have met in eight years, and I think it on that account worth describing.

The patient was a little Armenian girl, aged 3. She had had a *salek* for eight months. There was a huge foul ulcer 2 in. in diameter covered with heaped-up

* *Sal* is the Persian word for "year" and *salek* is its diminutive. Oriental sore takes about a year to run its course.

Panama Canal, Ancon, 1913	Hourly atmospheric conditions at Ancon, Panama Canal (Pacific side)						Atmospheric conditions which raised body temperature in the Lancashire cotton sheds				Degree to which body temperature was raised by exposure in the Lancashire cotton sheds		
	Temperature of air, F.		Relative humidity of air	Drying power of air per 10 cub. ft.	Velocity of wind per hour		Temperature of air, F.		Drying power of air per 10 cub. ft.	Movement of air per hour	Body temperature in mouth, F.	Pulse	Respiration
	Dry	Wet	Per cent	Grains	Miles		Dry	Wet	Grains	Miles			
August 1, 1 o'c. a.m.	76·0°	75·3°	96	3·3	8		76·0°	72·0°	20·0		99·4°	88	20
,, 2 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 3 ,,	76·0	75·5	97	2·5	7		76·0	72·0	20·0		99·4	88	20
,, 4 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 5 ,,	74·0	73·5	97	2·5	7	A	74·0	70·0	19·0		100·0	98	22
,, 6 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 7 ,,	78·0	75·4	86	14·0	7		78·0	73·5	23·0		100·0	100	30
,, 8 ,,	..	..	..	..	6		..	..	..		..	..	..
,, 9 ,,	84·0	78·5	74	32·5	5		84·0	77·0	39·0		100·3	84	25
,, 10 ,,	..	..	..	..	5		..	..	..		..	..	..
,, 11 ,,	88·0	80·2	66	47·7	5		88·0	77·5	61·0		100·2	104	20
,, 12 o'c. noon	..	..	..	..	5		..	..	..		..	..	..
,, 1 o'c. p.m.	89·0	81·2	66	48·5	5		89·0	79·0	60·0		100·0	108	24
,, 2 ,,	..	..	..	..	6		..	..	..		..	..	..
,, 3 ,,	90·0	82·5	67	48·0	5		90·0	75·0	82·0		99·8	94	24
,, 4 ,,	..	..	..	..	5	B	..	..	..		..	..	..
,, 5 ,,	82·0	76·7	75	29·2	11		82·0	76·0	33·0		99·2	88	14
,, 6 ,,	..	..	..	..	13		..	..	..		..	..	..
,, 7 ,,	78·0	75·6	87	13·0	9		78·0	73·5	23·0		100·0	100	30
,, 8 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 9 ,,	77·0	75·2	90	9·8	8		77·0	73·0	20·0		100·1	100	18
,, 10 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 11 ,,	77·0	75·2	90	9·8	9		77·0	73·0	20·0		100·1	100	18
,, 12 ,,	..	..	..	..	7		..	..	..		..	..	..
August 2, 1 o'c. a.m.	75·0	73·6	92	7·0	8		75·0	69·5	26·6		100·2	110	18
,, 2 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 3 ,,	74·0	72·6	92	7·0	7		74·0	70·0	19·0		100·0	98	22
,, 4 ,,	..	..	..	..	6	A	..	..	..		..	..	..
,, 5 ,,	73·0	71·4	91	8·0	6		73·5	68·0	24·5		100·0	90	22
,, 6 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 7 ,,	80·0	78·2	91	9·0	7		80·0	75·0	27·0		99·2	92	28
,, 8 ,,	..	..	..	..	5		..	..	..		..	..	..
,, 9 ,,	87·0	83·2	82	24·5	6		87·0	79·0	48·0		100·4	108	24
,, 10 ,,	..	..	..	..	6		..	..	..		..	..	..
,, 11 ,,	90·0	83·0	72	45·0	7		90·0	75·0	82·0		99·8	94	24
,, 12 o'c. noon	..	..	..	..	6		..	..	..		..	..	..
,, 1 o'c. p.m.	91·0	82·2	63	56·5	6	B	90·0	75·0	82·0		99·8	94	24
,, 2 ,,	..	..	..	..	4		..	..	..		..	..	..
,, 3 ,,	88·0	79·5	64	50·2	6		88·0	80·0	49·0		100·0	108	16
,, 4 ,,	..	..	..	..	6		..	..	..		..	..	..
,, 5 ,,	82·0	76·2	73	31·7	8		82·0	76·0	33·0		99·2	88	14
,, 6 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 7 ,,	78·0	76·0	89	11·0	8		78·0	73·5	23·0		100·0	100	30
,, 8 ,,	..	..	..	..	7	A	..	..	..		..	..	..
,, 9 ,,	76·0	75·3	96	3·3	6		76·0	72·0	20·0		99·4	88	20
,, 10 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 11 ,,	76·0	75·3	96	3·3	6		76·0	72·0	20·0		99·4	88	20
,, 12 o'c. midnight	..	..	..	..	..		..	..	..		..	..	..

No movement of air perceptible

Conditions bracketed A will cause pyrexia in many. Conditions bracketed B will not cause pyrexia in any.

Table to accompany Mathew D. O'Connell's Paper on "Meteorology of Malaria."

dirty, yellow crusts over the the left malar bone. Higher up, in the temporal fossa of the same side, was a similar ulcer, 1 in. in diameter. From underneath the crusts pus was oozing, and around the ulcers there was an area of induration ¼ in. wide and beyond that again there was œdema of the eyelids. The submaxillary and preauricular lymphatic glands were enlarged and tender. Scrapings from the base of the larger ulcer showed numerous Leishman-Donovan bodies.

Fomentations were ordered to be applied with a view to removing the crusts and cleaning the ulcer before beginning treatment.

The child was not brought again for nine days. The ulcers were cleaner and I was on the point of beginning a series of injections of hectine when I noticed that the child's head was a little retracted and that there was stiffness of the neck. Further examination showed that there was spasm of the masseter muscles. On inquiry I found that the child had had difficulty in opening its mouth for two or three days. The child died of a very rapidly progressive form of tetanus two days later.

Unfortunately, I did not have the satisfaction of finding the tetanus bacillus in the pus or scrapings from the ulcers. The chain of evidence is not therefore complete, but a careful search brought to light no abrasion of the surface of the body other than the ulcers described, and tetanus is not at all common in this part of Persia. When it does occur some very obvious port of entry is found. The severity and rapid termination of the case goes well with a site of infection placed so near to the important nerve centres.

Strictly speaking, it is not correct to say that death in this case was due to the Leishmania infection, but at any rate it is permissible to suggest that had not the child had the sores she would not have got tetanus and died. The case, I think, points a useful lesson, and I shall look with greater respect on *salek* in future. The ulcer was particularly well placed for added infections to occur: it must often have come in contact with the ground as the child tumbled about in play or slept there, as native children do, without pillow or mattress.

As to the treatment of *Leishmania tropica* with hectine, the use of the drug was suggested to me by Dr. Gachet, of the French Navy Medical Service, Professor of Medicine at the Royal University. We have given it by injection with a fine needle into the indurated periphery and base of the sore, repeated two to three times a week. The dose used has been 1 cg. for each 4 kilos of body-weight. The results have been good, healing generally taking place in three weeks to a month, and, what is very important in an affection which so often attacks the face, with very little scarring. When the ulcers are numerous, as they often are, I have found the intravenous injection of neo-salvarsan give excellent results. Arsenical compounds are, undoubtedly, the most effective remedies for cutaneous leishmaniosis that I have yet used.

BABESIA OR PIROPLASMA.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.
AND
Captain R. G. Archibald, M.B., R.A.M.C.
Pathologist, Wellcome Tropical Research Laboratories, Khartoum.

While searching through botanical literature in the course of a certain joint work in connection with the *Fungi imperfecti* we chanced upon the following:—

Schizomycetaceae Naegeli 1857.
Genus *Babesia* Trevisan 1889.

Definition.—Cocci ellipsoidei, longitudinaliter binatim seriati (diplococci longitudinales) in filamenta moniliformia, pseudodichotoma nuda concatenati. Arthrosporæ macrosomæ in apice filamentorum obvenientes.

Etymology.—Derived from the name of the celebrated Roumanian bacteriologist. V. Babès.

Species.—(1) *B. xanthopyretica* Trevisan 1889, found in people suffering from yellow fever; (2) *B. erysipeloidis* Trevisan 1889, found in people suffering from erysipelas.

It is obvious that as Trevisan applied the name *Babesia* in 1889 to a genus containing certain bacteria, this name cannot be used a few years later to name a genus of the protozoa and, therefore, the name *Babesia* Starcovici 1893 cannot be retained.

This brings the nomenclature of the genus of protozoal organisms discovered by Babès down to the year 1895, when Patton introduced the word "Piroplasma."

The synonyms will therefore stand as follows:—

Genus *Piroplasma* Patton 1895.

Synonyms. — *Hæmatococcus* Babès 1888 (*nec* Agardh); *Pyrosoma* Smith and Kilbourne 1893 (*nec* Péron); *Babesia* Starcovici 1893 (*nec* Trevisan); *Amœbosporidium* Bonome 1895; *Ixodioplasma* Schmidt 1904.

This, we hope, will end the confusion in that some authors use the name "Babesia" and others "Piroplasma" for the same genus of protozoal organism.

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Khartoum,
June 6, 1914.

A USEFUL PRESCRIPTION IN CHRONIC MALARIA WITH ENLARGED SPLEEN.

By James Cantlie, M.B., F.R.C.S.

I have used in the treatment of chronic malaria with enlarged spleen a combination of quinine, arsenic, opium and mercury for several years with marked benefit. The ingredients are really those of the old fever powder which was so largely used by our fathers in medicine when malaria was ripe in England, the chief difference being that the mercury was given

by them separately in the form of a blue pill, and used as a purgative. In the first place it is not because of being a purge that mercury owes its presence in the powder, but on account of its action as a germicide. It is given for the same reason as it is given for syphilis, to destroy the spirillum of syphilis; and although its action in malaria with hypertrophied spleen may be less apparent, practical experience shows it to be beneficial. We know the action of mercury in trypanosomiasis when combined with antimony, and we know also that as a preliminary to the treatment of almost every ailment calomel was administered in a stereotyped way by physicians in the middle of last century. It is not sufficient to say that the calomel served as a purge merely, for we know that for two, three or more days after a purgative dose of calomel the mercurial salt remains in the system, so that were the calomel included in my prescription taken out and given as it used to be given previously to the "ague powder," yet in the system would all the drugs combine and mercury would still play whatever part is assigned to it, be it given before or with the other ingredients. I prefer, however, to include the mercury in the powder and not give it in a purgative dose. The patient home from the tropics with frequently recurring attacks of fever, with a big spleen, anæmic to a degree, depressed and worried by illness, should not be given mercury as a purge. Milder measures should be used; for the "tropical" liver is not the "Aldermanic" liver, it is not overloaded with the products of the digestion of rich food and rare wines, but one depleted of wholesome blood, flooded with the toxins of intestinal or blood parasites, functionally exhausted by climate and from want of the nourishment and stimulus supplied by the fresh meat and vegetables of British tables. Such a liver does not do well on calomel nor on any powerful hepatic derivative. Severe measures are unsuitable, and the less vigorous the Spa treatment is the better.

The calomel introduced in the prescription, therefore, is not placed there for its purgative qualities but as a germicide. The next ingredient is arsenic, a drug with many therapeutic attributes and one which is used in malaria in many countries. In salvarsan arsenic is a potent factor, and the general application of the drug seems limitless, if Ehrlich's idea of its being a "sterilizer of the system" has any truth.

The combination of arsenic with quinine is no doubt a useful one, more especially in chronic malarial affections.

Opium in the form of pulvis ipecacuanhæ compositus is introduced into the prescription partly because of its traditional use in malaria but chiefly from the writer's experience of the benefits it confers. The effects of opium are legion and the full measure of its benefits seem unsearchable and innumerable. The dose is so minute that it might be deemed incapable of producing any therapeutic effect; this opinion may have theoretical argument, but it has not clinical experience to support it. Again, opium by itself is not so valuable as when it is combined as in Dover's powder. Opium has been used in malaria since the disease and the drug were known, and their disassociation is an affair of yesterday. That this has been a wise step is more than doubtful; our fathers in medicine believed in the combination, and their powers of observation were more acute than ours. Effect was their only test, success was their sole gauge of usefulness; they had not blood examination reports to support them in their beliefs nor laboratory methods to afford suggestions. We pride ourselves on our one drug for each disease, on the principle of the dock for the nettle-sting. We have condemned long prescriptions containing combinations of several potent remedies as unscientific, until we have well-nigh lost the art of writing a prescription. The "dock and nettle" system has had its day; scientific investigation shows that not infrequently two remedies are required: one to clear the blood of the parasite, another to kill the parasite after it has gained the tissues.

The prescription runs as follows:—

℞	Quininæ Hydrochlorid.	gr. v to gr. vii
	Acid. Arsenosi	gr. $\frac{1}{60}$,, gr. $\frac{1}{30}$
	Pulv. Ipecac. Co.	gr. iii ,, gr. iv
	Hydrarg. Subchloridi.	gr. $\frac{1}{10}$,, gr. $\frac{1}{6}$
	Fiat pulv. in cachets.	

Sig.: One at 11 a.m., and another at bed-time.

Annotations.

Antimony in Dermal Leishmaniasis.—Vianna (*Annales Paulista de Med. e Cir.*, ii. 167, 1914) finds that in Brazil the best remedy for lesions of the skin and mucous membranes is tartar emetic by intravenous injection; salvarsan and neosalvarsan have been entirely unsuccessful in curing the cutaneous lesions. The maximum dose was 1 c.c. of a 1 per cent. solution in sterilized normal saline. Generally smaller does were used, and used in chronic cases for considerable periods. The intravenous injections were given to children of 5 and to adults over 60. In two cases of nephritis the albumin increased and œdema developed with the maximum dose; on reducing the dose the trouble disappeared. Symptoms showing the limit of tolerance are pains in joints and muscles, or headache.

Plague in New Orleans.—On September 22, two fresh cases of bubonic plague were reported, one has since died; the other is expected to recover. There have been twenty-eight cases since the outbreak of the infection on June 27.

WITH the New Zealand Expeditionary Force coming to Europe are two dental lieutenants. These gentlemen were senior students at the Otago University, but on the outbreak of war were given special examinations, and thereafter granted special dental commissions.

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THE JOURNAL OF

Tropical Medicine and Hygiene

NOVEMBER 2, 1914.

SCIENCE AND WAR.

THAT war has proved wholly detrimental to human progress is not borne out by historical fact. In earlier days when transport was slow, when contact with the peoples of other nations was restricted almost to an infinitesimal degree, when the ignorance of the inhabitants of a country of the customs and ways of their neighbours prevailed to an extent almost incredible to-day, war was the only channel by which extensive contact was possible. The West was made more familiar with the East by the Crusades in the Middle Ages and long before the Romans spread light and learning to what was in their day the "world." To come down to more recent times no farther back than the Crimea, we are indebted to that war for modern hygiene. The fact that overcrowding was detrimental to health was not known, or if known to the few it was not acted upon practically. That sixteen men could inhabit a "bell" tent, covered with frozen snow, with no ventilation of any kind, and to which no fresh air at any time was admitted except when a soldier had to open the "door" of the tent to get out when called to sentry duty, was a common feature of sanitation even as shortly ago as 1854. That typhus prevailed was of course inevitable; that dysentery in an epidemic form found ready victims is readily understood, and that epidemics of cholera prevailed, when it is remembered that sanitation of camps or of our own dwellings was primitive in the extreme. The officers who cut some holes in the top of their tents through which air could find entrance and exit were the pioneers of our modern notions of ventilation, and by the genius of Parkes, of the Army Medical Department, the information gathered from war experiences served to found our knowledge of hygiene, both military and municipal. It is to the medical department of the British Army that the world owes a debt of gratitude for this world-wide benefit; the knowledge there acquired has been the basis of preventive medicine and of our domestic hygiene.

To take a concrete example. In 1866 Cohnheim, of the German Army, after the battle of Sadowa, went to Vienna to visit his friend and teacher, Stricker, the pioneer of research in many fields. He found Stricker working at the passage of the red blood corpuscles through the walls of the capillaries. Cohnheim was deeply impressed with the demonstration, and on the way back to Berlin he thought if the red corpuscles can find their way through the capillary walls, why cannot the white? It is unnecessary to relate that he had only to look to find their passage, a rudimentary fact which is known to even laymen amongst us to-day. The war between Germany and Austria brought Cohnheim to Vienna, and at any rate hastened a discovery which laid the foundation of modern pathology. To war, therefore, we can ascribe the acquisition of modern hygiene and pathology, two branches of science without which the practice of medicine would have remained mere empiricism.

AN INDIAN VOLUNTARY AID CONTINGENT.

INDIAN students and a few others resident in England on the outbreak of war volunteered to go to the seat of war as dressers, orderlies, and stretcher-bearers. The difficulty was to affiliate the members with any organized authority; and only after much discussion was it decided to form a separate contingent for use where they might be needed, and they placed themselves under Mr. Cantlie for training in first-aid, nursing, military hygiene, stretcher drill, ambulance wagon drill, and mode of carriage by

railway, &c., &c. Soon after commencing training, however, the news spread that the Native Army of India was on the way to Europe, and the problem of the sphere of usefulness of the Indian voluntary aid contingent was solved. The delight which thrilled the members of the contingent when the coming of their brethren was announced was electrical. Previously they went to their lectures and drills as if "creeping like snail unwillingly to school"; but immediately attention was riveted on every item of instruction, the text-books were devoured, the movements on the drill ground became smart to a degree, they turned out punctually to a second, and their work orderly to a hair. They had now a definite mission, and their true worth was disclosed.

There are many in England to-day who envy their going to the front—men and women who are denied that privilege; men and women who have been training for years, and are wearing their hearts out waiting to be allowed to help. Their petitions are rejected whilst their countrymen suffer. Not so the Indian contingent; their desire has been fulfilled, and they are thankful.

Amongst the members of the contingent are a goodly number of doctors, men who hold both Indian and British diplomas. These men sat down in the classes with the others and learned "first-aid," a noble example which has been followed but by few medical men in Britain. It is difficult for doctors to understand that first-aid is a specialty, not taught in our medical schools to either students or nurses; it is a distinct branch of surgery—simple it may be to doctors and nurses, but yet one requiring a short technical training. These Indian doctors without pretence went through their course of instruction, quietly helped their untrained fellow-members, and emerged at the end of the course skilled in a special branch of surgery, and fit to teach the subject because they themselves had wisely submitted to the necessary instruction, the discipline and the drill.

After instruction in the essentials of ambulance, the contingent was taken over by the Government and placed under the command of Colonel Baker, I.M.S. (retired), by whom and his officers an efficient auxiliary medical corps has been given to the Indian Army.

The war in Europe has been productive of good in many ways already, and let us hope that the good will continue. Enmities have been set aside, or, at any rate, kept in abeyance, political differences at home and racial prejudices everywhere have collapsed. Never was this more noticeable when, at a meeting held at the Polytechnic in London, Mr. Gandhi occupied the chair, whilst H.H. The Agha Khan delivered an address to the members of the Indian voluntary aid contingent. Hindu, Mohammedan, and Brahmin met together, and in speeches expressing tolerance of other beliefs and other creeds, and radiant with patriotism to India as part of the Empire, helped to smooth the road to betterment and peace.

The readiness with which the members of the Indian contingent acquired efficiency is only remarkable to those ignorant of the alertness and the receptivity of the brain of Indian students.

Reprint.

FURTHER RESEARCHES ON COMBINED VACCINES.*

By Aldo Castellani, M.D.
Director, Clinic for Tropical Diseases, Colombo (Ceylon).

Since 1905 I have prepared and used in man several combined vaccines, basing their preparation on the experimental work I carried out in Bonn in Professor Kruse's laboratory during the years 1901 and 1902. I succeeded then in demonstrating that an animal (rabbit) inoculated with two different bacteria produced, at the same time, agglutinins and immune bodies for both; and that provided a sufficient minimum quantity had been inoculated, the amount of agglutinins and immune bodies elaborated for each germ was about the same as in animals inoculated with one germ only. Moreover I demonstrated that inoculating an animal (rabbit) with three different germs (*Bacillus typhosus* B, *B. pseudo-dysentericus* No. 1 (Kruse), strain of *B. coli communis*), the amount of agglutinins and immune bodies elaborated for each germ is nearly the same as in animals respectively inoculated with one species only. In rabbits I found that by inoculating more than three species of micro-organisms no good results were obtained, but, in view of my recent work, if I had used animals of larger size I might, and probably should, have found that good results can be obtained even using more than three species. I showed that when immunization is obtained by a single inoculation, provided the minimum dose sufficient to obtain the maximum immunization be given, the amount of agglutinins and immune bodies elaborated by the inoculated animals is not in proportion to the amount of cultures injected. A series of rabbits inoculated with 2 c.c. of typhoid culture will give the same average agglutination limit and the same amount of immune bodies as a series of rabbits inoculated with 4 c.c.

Combined Typhoid + Paratyphoid A + Paratyphoid B Vaccine.

Since 1905 this vaccine has been extensively used by me with good results. Having already published several papers on it (*Centr. f. Bakt.*, 1909 and 1913; *British Medical Journal*, 1913, &c.) I will limit myself to stating here that my further investigation has confirmed my previous work, viz., that this combined vaccine is harmless; that it gives a certain amount of protection for the three diseases; and that it is advisable to use it always instead of the simple typhoid vaccine in countries where paratyphoid A

* Reprinted from the *Journal of the Ceylon Branch of the British Medical Association*, June, 1914.

and B occur, besides typhoid. The advisability of using such a vaccine is shown by the fact that I have seen two cases of persons inoculated with simple typhoid vaccine before sailing from Europe, developing paratyphoid A three months after landing in Ceylon: the diagnosis being made by hæmoculture. Moreover, cases of mixed infection, typhoid and paratyphoid A, or paratyphoid B, do occur, though not frequently. As a matter of fact I have recently observed a case which must be extremely rare, of contemporaneous triple infection: typhoid, paratyphoid A, and paratyphoid B. I hope to soon publish this case in detail, but I do not think there can be any doubt about the diagnosis, as the stools contained the three germs, the blood gave a strong agglutination for all three, and the absorption test showed that there were present specific agglutinins for each germ.

In previous papers I have given in detail the technique for the preparation of such vaccine; it suffices here to state that the vaccine consists of an emulsion of typhoid and paratyphoid A and B bacilli, killed by heat (53° C.) and standardized so that 1 c.c. contains approximately five hundred millions of typhoid bacilli and two hundred and fifty millions each of paratyphoid A and B. The vaccine may be prepared also without heating by emulsions from agar cultures in 0·75 per cent. salt solution to which 0·75 per cent. of carbolic has been added; the presence of 0·5 per cent. carbolic is sufficient to kill the germs. For the first dose 0·5 c.c. to 0·6 c.c. should be injected with aseptic precautions under the skin, preferably in the arm. The inoculation is followed after three to four hours by some pain and tenderness at the site of injection, and in a few hours later by fever (100° F. or 101° F.) and general malaise. All these symptoms have usually disappeared in thirty-six hours. A second injection of from 1 c.c. to 2 c.c. should be given seven to ten clear days after the first inoculation. It is often followed by less local reaction. A third injection (the same dose as the second) may be given with advantage after a further interval of seven to ten days.

Combined Cholera + Plague Vaccine.

On this combined vaccine I will say here only a few words, having already published papers on it elsewhere. Given the presence in Ceylon at the same time of both cholera and plague, it occurred to me to prepare a combined plague-cholera vaccine, which should contemporaneously give a certain amount of immunization for both diseases. The combined plague + cholera vaccine I prepare consists of an emulsion in carbolized (½ per cent.) normal salt solution, of plague bacilli and cholera vibrios from three days old cultures, standardized so that 1 c.c. of the emulsion contains approximately one thousand millions of plague bacilli, and two thousand millions of cholera vibrios. Of this vaccine, in adults, 1 c.c. is inoculated the first time subcutaneously in the arm, and 2 c.c. the second time, a week after the first injection. To date 250 individuals have been so inoculated. I can confirm the conclusions I came to in my previous papers, viz.:—

(1) The inoculation of the vaccine in the lower animals induces a production of protective substances for the plague bacillus and the cholera vibrio.

(2) The inoculation of such vaccine in human beings is harmless; the reaction is rather less marked than after the inoculation of Haffkine's, but severer than after Lustig's vaccine.

(3) A small amount of agglutinin both for plague and cholera appears in the blood of most of the inoculated persons. The agglutination for the plague bacillus is generally very slight (1 in 10, 1 in 20, or nil), but this is also the case when using a simple plague vaccine such as Haffkine's or Lustig's. The agglutination for cholera varies between the limits 1 in 20 and 2 in 60 (rarely higher) and is practically the same as in individuals inoculated with cholera vaccine only (see tables).

Combined Typhoid + Paratyphoid A + Paratyphoid B + Plague + Cholera Vaccine.

This combined "five diseases" vaccine consists of carbolized emulsion of typhoid, paratyphoid A and paratyphoid B bacilli, cholera vibrios, and plague bacilli. The technique of its preparation is as follows:—

Agar cultures twenty-four hours old are used in the case of typhoid, paratyphoid A, paratyphoid B and cholera; agar cultures three days old are used in the case of plague, as this germ grows slowly. The growth of the typhoid agar cultures is washed off with 0·75 per cent. salt solution containing 0·5 per cent. carbolic acid; is stored at room temperature eighteen to twenty-four hours and then tested for sterility and standardized in such a way that 2 c.c. of this carbolized typhoid vaccine will contain approximately one thousand millions of typhoid bacilli. The same procedure is carried out with paratyphoid A, paratyphoid B and plague; each of these carbolized vaccines will contain therefore one thousand million germs per each cubic centimetre. The same technique is used to prepare the cholera vaccine, but this vaccine is standardized in such a way as to make it contain four thousand million per cubic centimetre. After having prepared, standardized, and tested for sterility these five different vaccines, they are mixed together in the following proportions:—

Cholera	vaccine	.. ..	2 parts 2 c.c.
Plague	,,	.. ..	2 ,, 2 ,,
Typhoid	,,	.. ..	2 ,, 2 ,,
Paratyphoid A	,,	.. ..	1 ,, 1 ,,
Paratyphoid B	,,	.. ..	1 ,, 1 ,,

The mixed vaccine will therefore contain per cubic centimetre:—

Cholera	1,000 million
Plague	250 ,,
Typhoid	250 ,,
Paratyphoid A	125 ,,
Paratyphoid B	125 ,,

Method of Vaccination.

The inoculation is made subcutaneously in the arm, in the same manner as when using simple typhoid vaccine. In strong adults I give 1 c.c. the first time, and 2 c.c. a week later; in adults who do not appear to be very strong, or in individuals who

fear the reaction, as also in women, I give half doses, viz., ½ c.c. the first time and 1 c.c. the second time. Children between 10 and 16 years receive one-third the adult dose. Children below 10 years of age I have not yet inoculated. The inoculation of the vaccine is followed in a few hours by a local reaction (redness and some infiltration) and general reaction (fever, malaise, rheumatoid pains) which generally do not incapacitate one for work for more than twenty-four hours. The reaction may be said to be as a rule severer than after the inoculation of simple typhoid, or the mixed typhoid + paratyphoid A + paratyphoid B vaccine; a little severer also than after the inoculation with Lustig's simple plague vaccine; but certainly somewhat less severe, in my experience, than after using Haffkine's simple plague vaccine. It is to be noted that occasionally one comes across individuals who do not show, practically, any reaction.

Innocuity of the Mixed "Five Diseases" Vaccine.

Four persons who have volunteered have been inoculated nine times, at a week's interval, with 1 c.c. the first time and 2 c.c. on all the following occasions. They have remained in good general health, though two have had somewhat severe general and local reactions. One person who also volunteered has been inoculated with a double strength mixed vaccine four times—a vaccine which per cubic centimetre contained double the amount of germs than the one generally used. Apart from a more severe local reaction no untoward effects were noted.

Immunization obtained in Man by the Combined (Five Diseases) Vaccine.

Lack of time has prevented the study of the amount of all protective substances produced in inoculated individuals. The investigation, therefore, has been limited to studying the amount of agglutinins produced in individuals inoculated with the mixed five diseases vaccine, and comparing the results with those noted in individuals inoculated with simple one disease vaccines. Of course, one cannot gauge the actual immunization obtained by simply studying the agglutinins, but it is generally admitted that to a certain extent agglutination is a rough index for immunization. The results are collected in the tables on pages 329-332.

From these tables it will be seen that the two individuals inoculated with the combined five diseases vaccine produced agglutinins in large amount for typhoid, paratyphoid A and paratyphoid B; in small amount for cholera, and in very small amount for plague.

If we compare these results with those obtained in individuals respectively inoculated with simple typhoid vaccine, paratyphoid A vaccine, paratyphoid B vaccine, cholera vaccine and plague vaccine, we see that the amount of agglutinins produced in the latter is not distinctly larger. In the control individuals inoculated with simple typhoid, paratyphoid A, and paratyphoid B vaccines, the amount of agglutinins for such germs does not seem to be much higher; in individuals inoculated with simple cholera vaccine the amount of agglutinins present is small in individuals inoculated with simple plague vaccine; whatever kind of vaccine is used (carbolized, Lustig's or Haffkine's) it is also very small or absent.

COMBINED TYPHOID + MALTA FEVER VACCINE.

This vaccine consists of an emulsion in carbolized (½ per cent.) normal salt solution (0·75 per cent.) of typhoid bacillus and *Micrococcus melitensis*. Agar cultures twenty-four hours old are used in the case of typhoid; agar cultures three days old in the case of Malta fever. The growth of the typhoid agar cultures is washed off with 0·75 per cent. salt solution containing 0·5 per cent. carbolic acid, is stored at room temperature eighteen to twenty-four hours and then tested for sterility and standardized in such a way that 1 c.c. will contain approximately one thousand million typhoid bacilli. The same technique is used to prepare the Malta fever vaccine, but such vaccine is standardized so as to contain four thousand million per cubic centimetre. These two vaccines are mixed together in equal parts: the combined vaccine will contain per cubic centimetre five hundred million typhoid and two thousand million Malta fever. I have inoculated this vaccine in eleven individuals with no untoward symptoms. The reaction is hardly severer than after the inoculation of simple vaccine. I have not studied the agglutination week by week as I have done in other combined vaccines, but the blood of inoculated individuals develops a large amount of agglutinins for the typhoid bacillus and a certain amount of agglutinins for the Malta fever.

COMBINED "TYPHOID + PARATYPHOID B + PARATYPHOID A + MALTA FEVER VACCINE."

This vaccine consists of an emulsion in carbolized salt solution (0·75 per cent.) of typhoid, paratyphoid A, and paratyphoid B bacilli and *M. melitensis*. Agar cultures twenty-four hours old are used in the case of the first three germs mentioned; agar cultures three days old of Malta fever. The growth of the typhoid agar cultures is washed off with 0·75 per cent. salt solution containing 0·5 per cent. carbolic acid, is stored at room temperature eighteen to twenty-four hours and then tested for sterility and standardized in such a way that 1 c.c. will contain approximately two thousand million typhoid. The same technique is used to prepare the paratyphoid A and paratyphoid B vaccines, each of these being standardized to contain one thousand million. The same technique is used to prepare the Malta fever vaccine, but this vaccine is standardized in such a way as to contain four thousand million per cubic centimetre.

After having standardized and tested for sterility these four different vaccines they are mixed together in equal parts. Each cubic centimetre of the mixture will contain the following:—

Typhoid	500 million
Paratyphoid A	250 ,,
Paratyphoid B	250 ,,
Malta fever	1,000 ,,

TABLE I.—COMBINED TYPHOID + PARATYPHOID A + PARATYPHOID B + CHOLERA + PLAGUE VACCINE.
(Two inoculations, 1 c.c. the first, 2 c.c. the second.)

Individuals inoculated	Blood tested against	Limits of agglutination. Weeks after first inoculation								
		1	2	4	5	7	8	9	10	11
Kuppaswamy	*B. typhosus* ..	1/40	1/1200	1/300	1/150	1/100	1/60	1/100	1/60	1/40
	B. paratyphosus A	1/20	1/300	1/250	1/150	1/50	1/60	1/60	1/40	1/20
	B. paratyphosus B	1/20	1/250	1/200	1/100	1/50	1/40	1/60	1/20	1/20
	V. choleræ ..	1/20	1/20	1/40	1/30	0	0	0	0	0
	B. pestis	0	1/20	0	0	0	0	0	0	0
Periyaswamy	*B. typhosus* ..	1/40	1/1000	1/300	1/200	1/100	1/100	1/150	1/100	1/40
	B. paratyphosus A	1/20	1/250	1/250	1/150	1/100	1/40	1/60	1/20	1/20
	B. paratyphosus B	1/20	1/150	1/80	1/150	1/50	1/40	1/60	1/20	0
	V. choleræ ..	1/20	1/300	1/200	1/150	1/150	1/40	1/20	0	0
	B. pestis	0	0	1/20	1/20	0	0	0	0	0

TABLE II.—VACCINATION WITH COMBINED PLAGUE + CHOLERA VACCINE.
(Two inoculations, 1 c.c. the first, 2 c.c. the second.)

Individuals inoculated	Blood tested against	Limits of agglutination. Weeks after first inoculation						
		1	2	3	4	5	6	7
Tamil coolie No. 3	*B. pestis* ..	0	1/20	0	0	—	0	0
	V. choleræ ..	0	1/40	1/40	0	—	0	0
Tamil coolie No. 4	*B. pestis* ..	0	1/20	1/20	0	0	0	0
	V. choleræ ..	1/20	1/40	1/80	1/60	0	1/20	0
Tamil coolie No. 5	*B. pestis* ..	0	0	0	0	0	0	0
	V. choleræ ..	0	1/20	1/80	1/60	1/60	0	1/26

TABLE III.—VACCINATION WITH SIMPLE PLAGUE VACCINE.
(Haffkine—one inoculation of 4 c.c.)

Individuals inoculated	Limits of agglutination for *B. pestis*. Weeks after first inoculation							
	1	2	3	4	5	6	7	8
Tamil coolie No. 6	0	1/20	1/20	0	--	—	0	—
Cingalese No. 1	0	0	—	—	—	—	0	—

TABLE IV.—VACCINATION WITH SIMPLE PLAGUE VACCINE.
(Lustig—three inoculations.)

Individuals inoculated	Limits of agglutination for *B. pestis*. Weeks after first inoculation					
	1	2	3	4	5	6
Tamil coolie No. 7	0	0	1/20	1/20	--	0
Tamil coolie No. 8	0	1/20	0	1/20	0	0
Tamil coolie No. 9	0	0	0	—	—	0

TABLE V.—VACCINATION WITH SIMPLE PLAGUE VACCINE.
(Carbolized—two inoculations: 1 c.c. the first, 2 c.c. the second.)

Individuals inoculated	Limits of agglutination for *B. pestis*. Weeks after first inoculation						
	1	2	3	4	5	6	7
Cingalese No. 2	0	0	—	—	0	—	0
Tamil coolie No. 10	1/20	1/20	1/20	0	1/20	0	0

TABLE VI.—VACCINATION WITH SIMPLE CARBOLIZED CHOLERA VACCINE.
(Two inoculations: 1 c.c. the first, 2 c.c. the second.)

Individuals inoculated	Limits of agglutination. Weeks after first inoculation					
	1	2	3	4	5	6
Tamil coolie No. 11	1/20	1/40	1/20	1/20	0	0
Tamil coolie No. 12	0	1/40	1/40	0	1/20	0
Tamil coolie No. 13	1/20	1/80	—	1/60	1/20	0

TABLE VII.—VACCINATION WITH SIMPLE TYPHOID VACCINES.
(Two inoculations: 0·6 c.c. the first, 1·2 c.c. the second.)

Individuals inoculated	Limits of agglutination for *B. typhosus*. Weeks after first inoculation										
	1	2	3	4	5	6	7	8	9	10	11
Cingalese No. 3 (carbolized vaccine) ..	1/20	1/800	1/300	1/200	2/200	—	1/100	—	1/60	1/60	1/60
Cingalese No. 4 (ordinary heated vaccine)	1/20	1/500	1/500	1/200	1/300	1/150	1/150	1/150	1/150	—	1/60

TABLE VIII.—VACCINATION WITH SIMPLE PARATYPHOID A VACCINE.
(Two inoculations: ½ c.c. the first, 1 c.c. the second.)

Individuals inoculated	Limits of agglutination for *B. paratyphosus* A. Weeks after first inoculation										
	1	2	3	4	5	6	7	8	9	10	11
Tamil (Singho)	1/20	1/80	1/20	1/40	1/60	1/60	1/60	1/60	1/40	—	1/40
Cingalese (Wellar)	0	1/100	1/100	1/60	1/60	1/80	1/80	1/60	1/60	—	1/60

TABLE IX.—VACCINATION WITH SIMPLE PARATYPHOID B VACCINES.
(Two inoculations: 0·6 c.c. the first, 1·2 c.c. the second.)

Individuals inoculated	Limits of agglutination for *B. paratyphosus* B. Weeks after first inoculation										
	1	2	3	4	5	6	7	8	9	10	11
Cingalese (Asson)	0	1/80	1/60	1/60	1/80	1/60	1/20	1/20	1/20	—	1/20
Tamil (Karuppen)	0	1/20	1/80	1/80	1/60	1/20	1/20	1/20	0	—	0

TABLE X.—VACCINATION WITH "TYPHOID + PARATYPHOID A + PARATYPHOID B + MALTA FEVER" COMBINED VACCINE.
(Two inoculations: 0·5 to 0·6 c.c. the first, 1 to 1·2 c.c. the second.)

Individuals inoculated	Agglutination for	Limits of agglutination. Weeks after first injection							
		1	2	3	4	5	6	7	8
Ha	*B. typhosus*	0	1/400	1/400	1/400	1/200	1/200	1/150	1/150
	B. paratyphosus A ..	0	1/200	1/150	1/150	1/150	1/100	1/100	1/100
	B. paratyphosus B ..	0	1/300	1/100	1/100	1/100	1/80	1/80	1/80
	M. melitensis	0	1/20	1/40	1/100	1/150	1/80	1/100	1/100
Wellan No. 2	*B. typhosus*	0	1/600	1/500	1/500	1/300	1/200	1/200	1/150
	B. paratyphosus A ..	0	1/200	1/200	1/100	1/100	1/80	1/80	1/80
	B. paratyphosus B ..	0	1/200	1/150	1/100	1/100	1/100	1/80	1/80
	M. melitensis	0	1/20	1/60	1/80	1/100	1/100	1/80	1/80

Of this vaccine 0·5 to 0·6 c.c. is injected subcutaneously in the arm the first time, and 1 to 1·2 c.c. the second time, after a week.

I have used this vaccine in a fairly large number of persons. I may say that the reaction was hardly higher than after the simple typhoid or mixed typhoid paratyphoid A and paratyphoid B vaccines. The blood of all the inoculated persons developed a large amount of agglutinins for typhoid, paratyphoid B and paratyphoid A, and a certain amount for Malta fever. The amount of agglutinins produced for each germ was apparently not distinctly less than in control individuals inoculated with simple "one disease" vaccines. (See tables.)

TABLE XI.—VACCINATION WITH SIMPLE MALTA FEVER VACCINE.

(Two inoculations: 0·6 c.c. the first, 1·2 c.c. the second.)

Individuals inoculated	Limits of agglutination for *M. melitensis*. Weeks after first injection							
	1	2	3	4	5	6	7	8
Suppen (Tamil) ..	0	1/20 (?)	1/40	1/60	1/80	1/80	1/60	1/60
Mr. S. (European)	0	0	1/40	1/120	1/150	1/100	1/80	1/100

stated in previous paragraphs and standardized as follows:—

Typhoid	2,500	million	per cubic	centimetre
Paratyphoid A ..	1,000	,,	,,	,,
Paratyphoid B ..	1,000	,,	,,	,,
B. asiaticus	1,000	,,	,,	,,
B. columbensis ..	1,000	,,	,,	,,

These vaccines are mixed together in equal parts so that each cubic centimetre of the combined vaccine will approximately contain:—

Typhoid	500 million
Paratyphoid A	200 ,,
Paratyphoid B	200 ,,
B. asiaticus	200 ,,
B. columbensis	200 ,,

Of this combined vaccine 0·5 to 0·6 c.c. is inoculated the first time, and 1 to 1·2 c.c. the second time, a week later. The reaction is not much severer than after a simple typhoid or typhoid-paratyphoid vaccination. The inoculated individuals develop a large amount of agglutinins of typhoid, paratyphoid A and paratyphoid B practically in the same amount as control individuals inoculated with simple "one disease" vaccines. Agglutinins for *B. asiaticus* and *B. columbensis* are, however, present in most cases in not very large amount and may soon disappear.

TABLE XII.—TYPHOID + PARATYPHOID A + PARATYPHOID B + MALTA FEVER + *B. columbens s* + *B. asiaticus*.

(Two inoculations: 0·6 c.c. the first, 1·2 c.c. the second.)

Individuals inoculated	Agglutination for	Limits of agglutination. Weeks after first inoculation					
		1	2	3	4	5	6
Subetheris (Cingalese)	Typhoid	0	1/600	1/500	1/400	1/400	1/200
	Paratyphoid A ..	0	1/500	1/500	1/300	1/300	1/300
	Paratyphoid B ..	0	1/500	1/500	1/500	1/300	1/200
	Malta fever	0	1/20	1/20	1/80	1/100	1/100
	B. columbensis ..	0	1/100	1/100	1/80	1/40	0
	B. asiaticus	0	1/80	1/100	1/100	1/80	1/60
Mr. D. ....(European)	Typhoid	1/20	1/500	1/500	—	—	1/400
	Paratyphoid A ..	0	1/400	1/400	—	—	1/200
	Paratyphoid B ..	0	1/400	1/400	—	—	1/200
	Malta fever	0	0	1/20	—	—	1/80
	B. columbensis ..	0	1/150	1/80	—	—	0
	B. asiaticus	0	1/300	1/200	—	—	1/60

COMBINED "TYPHOID + PARATYPHOID A + PARATYPHOID B + *B. columbensis* + *B. asiaticus*" VACCINE.

There being in Ceylon cases of fever due to *B. columbensis* and *B. asiaticus*, I have prepared a combined vaccine containing these two germs also. This vaccine consists of an emulsion in carbolized (½ per cent.) salt solution (0·75 per cent.) of typhoid, paratyphoid A, paratyphoid B bacilli, *B. asiaticus*, and *B. columbensis*.

The individual carbolized vaccines are prepared as

TABLE XIII.—VACCINATION WITH SIMPLE *B. columbensis* VACCINE.

(Two injections: 0·6 c.c. the first, 1·2 c.c. the second.)

Individual inoculated	Limits of agglutination. Weeks after first injection					
	1	2	3	4	5	6
Tamil Coolie No. ..	1/20	1/100	1/80	1/80	1/40	1/20
Tamil Coolie No. ..	0	1/100	1/100	1/40	1/40	0

COMBINED "TYPHOID + PARATYPHOID A + PARATYPHOID B + *M. melitensis* + *B. columbensis* + *B. asiaticus*" VACCINE.

This vaccine consists of an emulsion in carbolized (½ per cent.) salt solution (0·75 per cent.) of typhoid bacilli, paratyphoid A, paratyphoid B bacilli, *B. asiaticus*, *B. columbensis*, typhoid, Malta fever micrococcus.

The individual vaccines are prepared as described in previous paragraphs and standardized as follows, per cubic centimetre:—

Typhoid	2,400 million
Paratyphoid A	1,000 ,,
Paratyphoid B	1,000 ,,
B. asiaticus	1,000 ,,
B. columbensis	1,000 ,,
Malta fever	4,000 ,,

These vaccines are mixed in equal parts. The combined "six diseases" vaccine will therefore contain per cubic centimetre:—

Typhoid	400 million	
Paratyphoid A	166 ,,	(about)
Paratyphoid B	166 ,,	,,
B. asiaticus	166 ,,	
B. columbensis	166 ,,	
Malta fever	666 ,,	

I have inoculated numerous persons with this combined vaccine, 0·5 to 0·6 c.c. the first time, and 1 to 1·2 c.c. the second time a week later. The inoculated people have developed a large amount of agglutinins for typhoid, paratyphoid A, and paratyphoid B; in fact, the great amount of agglutinins for *B. paratyphosus* A and *B. paratyphosus* B is indeed remarkable, being higher than in control individuals inoculated with simple paratyphoid A and paratyphoid B vaccines; a certain amount for Malta fever. Agglutinins for *B. asiaticus* and *B. columbensis* were produced in fairly large quantity but soon disappeared. This, however, is apparently the case also with control individuals inoculated with simple *B. columbensis* and *B. asiaticus* vaccines.

TABLE XIV.—VACCINATION WITH SIMPLE *B. asiaticus* VACCINE.

(Two inoculations: 0·6 c.c. the first, 1·2 c.c. the second.)

Individual inoculated	Limits of agglutination for *B. asiaticus*. Weeks after first infection					
	1	2	3	4	5	6
Tamil Coolie No. ..	1/20	1/200	1/150	1/100	1/80	1/60

COMBINED DYSENTERY + TYPHOID + PARATYPHOID VACCINE.

For the preparation of this combined vaccine broth cultures should never be used, as broth cultures of dysentery bacilli give rise to an extremely painful infiltration at the site of the inoculation. Peptone water cultures should be used, or better, emulsions in salt solution, such as I use at the present time. The combined vaccine I now prepare consists of an emulsion of Shiga-Kruse, Hys Y bacillus, original Flexner-bacillus, a Flexner-like bacillus No. 1 isolated in Ceylon, a Flexner-like bacillus No. 2 also isolated in Ceylon, typhoid bacillus, paratyphoid bacillus A, and paratyphoid bacillus B. The individual vaccines are prepared by making emulsions from twenty-four-hour agar cultures, in normal salt solution (0·75 per cent.) to which 0·5 per cent. of carbolic acid has been added.

The individual vaccines are standardized as follows per cubic centimetre:—

Typhoid bacillus	4,000 million
Paratyphoid A bacillus	1,000 ,,
Paratyphoid B bacillus	1,000 ,,
Shiga-Kruse bacillus	1,000 ,,
Flexner bacillus	1,000 ,,
Hys Y bacillus	1,000 ,,
Flexner-like No. 1	1,000 ,,
Flexner-like No. 2	1,000 ,,

These vaccines are mixed in equal parts so that 1 c.c. of the mixed vaccine will contain:—

Typhoid	200 million
Paratyphoid A	125 ,,
Paratyphoid B	125 ,,
Shiga-Kruse	125 ,,
Flexner	125 ,,
Hys Y	125 ,,
Flexner-like No. 1	125 ,,
Flexner-like No. 2	125 ,,

Of this vaccine 0·5 to 0·6 c.c. is given hypodermically the first time and 1 to 1·2 c.c. after a week. The reaction is somewhat severer as a rule than after the typhoid-paratyphoid vaccine. As regards amount of protective substances induced by such vaccine, very little can be said as the agglutination for the germs of the dysentery group was generally slight, the agglutination limit seldom being higher than 1 in 40; it was also very irregular and inconstant, but the same may be said of individuals inoculated with simple Shiga-Kruse, Flexner, &c. vaccines. Typhoid, paratyphoid A and paratyphoid A and B agglutinins, on the other hand, are produced in fair amount, though, as a rule, distinctly less than in control individuals inoculated with simple typhoid, paratyphoid A and paratyphoid B vaccines. Possibly the amount of bacteria of each species inoculated falls below the necessary minimum.

CHOLERA + PLAGUE + TYPHOID + PARATYPHOID A + PARATYPHOID B + MALTA FEVER VACCINE.

This vaccine consists of an emulsion in carbolized (½ per cent.) salt solution (0·75 per cent.) of cholera vibrions, plague bacilli, typhoid, paratyphoid A and B bacilli and *M. melitensis*. The individual vaccines are prepared as described in previous paragraphs, and standardized as follows per cubic centimetre:—

Cholera	4,000 million
Plague	1,000 ,,
Typhoid	1,000 ,,
Paratyphoid A	1,000 ,,
Paratyphoid B	1,000 ,,
Malta fever	4,000 ,,

These vaccines are mixed together in the following proportions:—

Cholera	vaccine	2 parts	2 c.c.
Plague	,,	2 ,,	2 ,,
Typhoid	,,	2 ,,	2 ,,
Paratyphoid A	,,	1 part	1 ,,
Paratyphoid B	,,	1 ,,	1 ,,
Malta fever	,,	2 parts	2 ,,

Of this mixed vaccine 1 c.c. is inoculated the first time and 2 c.c. the second, a week later. This vaccine is still in the experimental stage, having being used only in six individuals. The reaction is somewhat severe and similar to that observed after inoculation of a simple plague vaccine or a combined plague cholera vaccine. From some observations made it would seem that the production of agglutinins is very similar to that observed in individuals inoculated with one disease vaccines, but the investigation is still to be continued.

Résumé and Conclusions.

(1) The preparation of combined vaccines is based, I think I may venture to say, on the experimental work I carried out in 1901-1902 in Bonn, in Professor Kruse's Institute, when I demonstrated that in inoculating an animal with two or three species of bacteria—provided a sufficient minimum quantity was given—agglutinins and immune bodies for all the germs were elaborated, the amount of agglutinins and immune bodies elaborated for each germ being nearly the same as in animals respectively inoculated with only one species.

(2) I have prepared and used in man the following vaccines:—

(1) Typhoid + paratyphoid A + paratyphoid B.
(2) Typhoid + Malta fever vaccine.
(3) Typhoid + paratyphoid A + paratyphoid B + Malta fever.
(4) Typhoid + paratyphoid A + paratyphoid B + *B. asiaticus* + *B. columbensis*.
(5) Typhoid + paratyphoid A + paratyphoid B + *B. asiaticus* + *B. columbensis* + Malta fever.
(6) Typhoid + paratyphoid A + paratyphoid B + dysentery Kruse-Shiga + dysentery Flexner + dysentery Hys Y + dysentery Flexner-like No. 1 + dysentery Flexner-like No. 2.
(7) Cholera + plague.
(8) Cholera + plague + typhoid + paratyphoid A + paratyphoid B vaccine.
(9) Cholera + plague + typhoid + paratyphoid A + paratyphoid B + Malta fever.*

(3) The inoculation in man of the above combined vaccines is harmless. The reaction is not severe, with the exception of the "cholera + plague" and "cholera + plague + typhoid + paratyphoid A + paratyphoid B" vaccines, when the reaction is severe, though apparently rather less so than after Haffkine's simple plague vaccine.

(4) The combined vaccines I am now using consist of carbolized emulsions of agar cultures in normal salt solution without heating. These emulsions seem to give a less painful local reaction than broth cultures killed by heat. The presence of 0·5 per cent. carbolic acid is sufficient to kill the germs. The "typhoid + paratyphoid A + paratyphoid B vaccine" is, however, also prepared by heating cultures at 53.

(5) The individuals inoculated with the above-mentioned combined vaccines generally produce agglutinins for each species of bacteria, and the amount for each species is not much less than control individuals inoculated with simple "one disease" vaccines. The only exception—though only to a certain extent—seems to have been in the case of the typhoid-dysentery vaccines.

(6) Combined vaccines, when efficient, are of practical advantage, saving a great deal of time, and rendering possible a contemporaneous vaccination for several different maladies.

References to previous papers on mixed vaccines:—

Castellani (1902). *Zeitschrift für Hygiene.*
,, (1904). Ceylon Medical Reports.
,, (1909). *Centralblatt für Bakteriologie.*
,, (1909). *Transactions of the Bombay Medical Congress.*
,, (1912). *Transactions of the Society of Tropical Medicine.*
,, (1913). *The Lancet.*
British Medical Journal.
Centralblatt für Bakteriologie.

* The typhoid + paratyphoid A + paratyphoid B vaccine and the typhoid + paratyphoid A + paratyphoid B + Malta fever vaccine are now prepared according to my instructions by the Serum Institute of Berne.

Burma Rice.

Although Burma has only ten million acres under rice, as compared with fifty million acres in Bengal, it exports no less than 75 per cent. of the total quantity of rice shipped from India. This is due to the fact that its population is small in comparison with the rice acreage, so that there is a large surplus of rice for export. Though the available area for rice has now been almost entirely taken up in Burma, there are still possibilities of increasing the output by irrigation and by intensive cultivation, so that there seems to be no reason to expect any falling-off in the Burmese exports in the near future. Rice is cultivated in Burma both in the Deltaic Region, with a rainfall of 70 to 200 in. per annum, and in the Central Region with the low rainfall of 25 to 35 in. per annum. In the second of these areas rice is a crop of secondary importance, except where irrigation is possible. Apart from manurial and other experiments having for their object the introduction of improved methods of cultivation, the Department of Agriculture in Burma is carrying on experiments for the improvement of the rice grain. The chief objects of these experiments are: (1) The elimination of red-grained and awned varieties of rice; (2) the production of grain which shall be free from awns and red skin, and shall be of uniform size, vitreous in appearance when husked, and spheroidal rather than cylindrical in shape; (3) the avoidance of dirt and foreign seed in shipments of rice. This work is being done at the Mandalay and Honwabi experiment stations, and a brief description of the methods followed is given in a paper read by Mr. A. C. McKerral at the Third International Congress of Tropical Agriculture held in London last summer.—*Journal of the Royal Society of Arts, October* 23, 1914.

Reviews.

THE CHEMICAL EXAMINATION OF WATER, SEWAGE, FOODS AND OTHER SUBSTANCES. By J. E. Purvis, M.A., University Lecturer in Chemistry and Physics as applied to Hygiene and Public Health, St. John's and Corpus Christi Colleges, Cambridge, and T. R. Hodgson, M.A., Public Analyst for the County Boroughs of Blackpool and Wallasey, formerly of Christ's College, Cambridge. Demy 8vo. Pp. viii. + 228. Cambridge University Press. 1914. Price 9s. net.

This book is one of a series about to be brought out by the syndics of the Cambridge University Press, upon a scientific basis, owing to the increasing importance of the study of hygiene and various matters connected with public health.

The present volume is intended for the use of students attending courses of instruction for diplomas and degrees in public health, as well as for those studying the chemistry of water, sewage effluents, foods, disinfectants, &c. There is no doubt that analysts and others engaged in public health matters generally will find its contents useful.

The authors do not profess to give an exhaustive account of all available methods of examination, but describe those they have tested both in laboratory instruction and in daily analytical work.

No less than eighty pages are devoted to water, sewage and sewage effluents. The whole question is gone into very carefully and exhaustively, a considerable number of typical analyses being introduced to illustrate variations which may occur in the composition of the articles themselves.

Such simple, but necessary, foods as milk, cream, butter, margarine, lard, dripping, suet, cheese, edible oils, tea, coffee, chicory, cocoa, flour, baking powder, bread, pepper, mustard, cane sugar, golden syrup, honey, &c., are all dealt with and analyses of their nutrient and other contents given. The extent to which alcoholic beverages can be adulterated is shown, as well as methods by means of which the said adulteration can be detected.

There is an addendum giving a table of atomic weights, alcoholic tables, volumes of oxygen and nitrogen absorbed from the atmosphere by distilled water and sea-water, as well as other useful information. The index is a good one.

The book is neatly bound and not too heavy to handle with ease.

BURSATI. Memoirs of the Department of Agriculture in India. Major J. E. Holmes, C.I.E. September, 1914. Vol. xi, No. 5, p. 19.

Major Holmes gives an interesting account of this disease, and the results of some research work which lead him to believe that bursati is a mycosis due to a sporotrichum in that it closely resembles the sporotrichosis of horses and mules described by Carougeau in Madagascar. Bursati is prevalent in India among horses during the rainy periods and sometimes in the hot weather. It invades the skin and subcutaneous tissue of the angles of the mouth, the prepuce and glans penis or vulva and the fetlocks and pasterns. It begins as a subcutaneous nodule which eventually invades the skin and forms an indolent open sore. Imbedded in the sore are characteristic yellowish spherical bodies, larger than a pin's head, and known as "kunkur bodies." The disease has been classified, on insufficient grounds, with summer sore, granular dermatitis and other similar skin affections. But the nematode embryos present in these affections are absent from the bursati sores; on the other hand, bursati sores, like "leeches," to which they bear a clinical resemblance, have been shown to contain a fungus. Major Holmes describes and pictures mycelium and spores found in the lesions, and cultures of the fungus on Sabouraud's medium. The cultures are white chalk-like growths which show on removal a dry opaque skin, and in the opinion of Dr. Butler, Imperial Mycologist to the Government of India, resemble *Sporotrichum minutissimum*. It is noteworthy that the healing of the lesions was promoted by arsenical treatment (internally), and also that cases improved under mercury and iodide of potassium. As a criticism of Major Holmes' conclusions it may be remarked that the description of the cultures is not readily recognizable as that of *S. beurmanii*, which is found in sporotrichosis of humans and animals, and that mycelium is not found in the lesions of that disease, but only in cultures outside the body, so that one must, perhaps, await further evidence before definitely placing this disease among the sporotrichoses.

H. G. ADAMSON.

Notes and News.

DROITWICH.

AMONGST Anglo-tropical health resorts Droitwich has an interest of its own. The saline content of its water is higher than that of any other spa, and it occupies a prominent position in the treatment of chronic rheumatism and all the rheumatoid affections. For sciatica and all forms of neuralgia, from a gouty and debilitating cause, it holds a unique position.

It has always struck us that the best time to visit Droitwich is immediately upon return from the Tropics and other places where the work has been of an arduous nature, and we feel sure that in these strenuous times many will appreciate having their attention directed to Droitwich. We know of no better place to commence or to complete restoration to perfect health, to permit return to the strain and stress which previously have caused incapacity for arduous toil. Particularly it is desirable to bear in mind that not only are there good railway facilities from London, but also from the northern, western, and southern parts as well—from Glasgow, Liverpool, Brighton and Southampton.

THE USES OF THE SOYA BEAN.

THE soya bean is only at times used for food by the Chinese and chiefly when supplies of the usual food products are scarce. The soya bean has been cultivated by the Chinese chiefly for its oil and for the residue known as "bean cake" for fertilizing the soil.

There are six varieties of beans commonly grown in China. These varieties are known as the yellow, the green, the black, the red, the white, and the small green. Of these the yellow, green, and black are soya beans, and are distinguished from the others by their size and ovoid shape. The red bean is used by the people as food, the beans in their pods whilst green being cooked and served chopped with oil or other dressing.

The white bean is used chiefly in the manufacture of what is known as "bean curd," one of the most common food products used by the people of China. The beans are partially cooked and are then ground in a primitive stone mill. To these beans as they are ground a considerable quantity of water is added, and the ground product is gathered on a tray and drained of most of the water. It partially solidifies and when drained it is cut in slices and eaten with soy sauce, which in itself is the fermented liquor of ground soya beans.

This curd is also dried and made into cakes. Whenever wheat flour rises in price, beans of various sorts, including the soya bean, are used as food.

Bean oil is used as food, as an illuminant, and as a paint. Soy, the Chinese sauce, which is the basis for most modern table sauces, is simply manufactured by grinding the beans and mixing the meal with water and a Chinese yeast. The mixture is then allowed to stand for from three to four months, when it is drained off to form the sauce.

THE NORTH MANCHURIAN PLAGUE PREVENTION SERVICE.*

THE disastrous epidemic of pneumonic plague which raged in Northern Manchuria in the winter of 1910-11 induced the Chinese authorities to seek the counsel and assistance of the great Powers in the prevention of that disease, and incidentally of others. An international conference was held at Mukden in April, 1911, and the delegates there assembled unanimously advised the institution of a North Manchurian Plague Prevention Service.

OBJECTS OF THE NORTH MANCHURIAN MEDICAL SERVICE.

The staff comprises eight medical men, two of whom are graduates of Cambridge and one of Edinburgh University, the others being graduates either of the Peiyang Medical College or of the Union Medical College, Peking. The only European member of the staff, Dr. F. E. Reynolds, acts as bacteriologist to the department. The annual sum voted for carrying on the service is 78,000 roubles—a little over £8,000 in English money. The headquarters are at Harbin, where a large hospital has been built in which 50 plague cases can be isolated as well as 250 contacts. Since its opening in December, 1912, this hospital has not been needed for plague, and no fewer than 10,169 patients suffering from diseases of a general character have been treated in it. Other hospitals have been built, or are being erected, at Lahasusu, Taheiho, and Sansing. Dr. Tuck expresses the hope that eventually the medical officers will obtain a voice in the direction of local sanitary affairs, the control of which in Manchuria is at present entirely in the hands of laymen.

INVESTIGATIONS INTO THE RELATIONSHIP OF THE TARBAGAN TO HUMAN PLAGUE.

During part of the inquiry he was accompanied by Russian experts under Professor Zabolotny. It appears that although the tarbagan occasionally suffers from plague the epizootic seems never to be extensive, so that it is natural to assume that this animal does not play so important a part as the rat in the spread of the disease. Dr. Tuck regards its direct relationship with human plague as almost a negligible quantity. He draws attention to the occurrence, especially in recent years, of outbreaks of plague, frequently of the pneumonic form, in various parts of Siberia, which are now regarded as endemic centres of the infection. It is thought very probable that the great Manchurian epidemic of 1910-11 had its source in infection brought from one of these areas, and not from the tarbagan, as was formerly believed. No case of plague in man or animal has actually occurred in Manchuria since the end of the recent outbreak, that is, since April, 1911.

THE HISTOLOGY OF THE LESIONS MET WITH IN PNEUMONIC PLAGUE.

Some material taken from fatal cases of pneumonic plague in 1911 were forwarded to Cambridge University for examination, the results of which are embodied in a joint report by Dr. Tuck and Professor Sims Woodhead, entitled "Notes on the Histology of some of the Lesions found in Pneumonic Plague." The material included portions of the heart muscle, lung, bronchial glands, liver, spleen, and kidney. After describing the lesions, it is stated that the histology of the specimens afforded evidence of the presence of an extremely acute septicæmic condition. The authors then go on to observe that their investigations point to the suggestion that in the Manchurian outbreak the amount of the infective material gaining access to the upper respiratory passages was of importance in determining the character of the septicæmia. They are satisfied that this was an instance of a septicæmia or bacteræmia resulting from a pulmonary infection. In warm countries the people live in the open, and the facilities and channels by which plague infection is communicated appear to be those provided by rats and fleas; the plague material is carried more or less directly from one patient to another, or from the rat by the flea. In the human subject the local reaction of the tissues and the bubo may prevent the extension of the bacteria, especially

* "North Manchurian Plague Prevention Service Reports from 1911 to 1913." Edited by Wu Lien Teh (G. L. Tuck), M.A., M.D., B.C.Cantab. Cambridge University Press. 1914. Pp. 186, with many illustrations.

if the dose is small and the septicæmic condition occurs at a comparatively late stage, whilst if there is good reaction of resisting tissues the disease may never become septicæmic. If, however, the septicæmia once develops it is evident that the internal organs will be affected in much the same way as they are in pneumonic plague. In Manchuria, where plague was at its height in the depth of winter, the facilities for the inhalation or ingestion of large numbers of plague bacilli were far greater than they could ever possibly be in warm countries, where people live more or less in the open. The Manchurian patients lived in overcrowded and badly ventilated houses, with doors and windows tightly closed because of the intense cold, and, moreover, artificially heated. The intensely fatal character of the Manchurian outbreak was due to the massive doses of the infection received by the patients.

Correspondence.

INTRAMUSCULAR INJECTIONS OF QUININE.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIR,—Recently several letters have appeared in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE on the question of the advisability or the utility of hypodermic injections of quinine in malarial cases.

In the numbers of the Journal which I have read mention is not made of those rare cases where a patient has an idiosyncrasy to quinine *per oram*, and suffers from intense headache, vertigo, nausea, and a very severe form of urticaria.

This urticaria may be of such intensity as to frighten the patient from taking quinine in any form.

Recently in Borneo I had such a patient, a surveyor, who had to tramp and camp in the jungle and native villages where he had every chance of acquiring malaria. He had not taken any quinine because he said "it was poison to him." Having a certain doubt as to the reality of this poisoning I persuaded him to take 10 grs. of bi-hydrochloride of quinine by the mouth. The result was most distressing.

Then I gave him hypodermics of the same salt three times a day for two days, then one injection daily for a week. No poisoning took place from these injections. The patient recovered and felt that at last he could take quinine and get back to his employment. He so appreciated the value of the hypodermic injections that he purchased a syringe and ampoules and injected himself twice a week thereafter as a prophylactic. He had no further attacks of malaria, and looked and felt a healthier man.

This little experience may be of interest to many of your readers in tropical practice, where one has to act promptly in severe cases of malaria fever, and use any means of introducing quinine into the human body available.

Yours, etc.,

H. J. McGRIGOR,

Captain, R.A.M.C. Reserve of Officers.

Aldershot.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

Deaths.—T. P. Fraser, M.B., Ch.B.Aberd., D.P.H.Camb., killed in action; J. A. Harley, M.B., Ch.B.Edin.; E. J. H. Garstin, M.B., B.Ch., B.A.O.Dub., Medical Officer, Nigeria.

Transfers.—J. H. Collier, M.D., C.M.Aberd., L.R.C.S. & P., L.M.Edin., L.F.P.S.Glas., Senior Medical Officer (Grade 3), has been transferred from Nigeria to the Gold Coast; N. A. D. Sharp, M.R.C.S.Eng., L.R.C.P.Lond., Medical Officer, has been transferred from the Gold Coast to Nigeria; A. F. Kennedy, M.B., B.Ch., B.A.O.Ire., Medical Officer, has been transferred from Gambia to Nigeria; R. W. Orpen, L.R.C.P. & S., D.P.H.Ire., Medical Officer, has been transferred from Sierra Leone to the Gambia; J. W. S. Macfie, B.A.Cantab., B.Sc. Edin., M.B., Ch.B.Edin., D.T.M.Liv., Medical Officer, has been transferred from Nigeria to the Gold Coast.

Promotions.—W. H. G. H. Best, L.R.C.P. & S.Ire., Major R.A.M.C. (Special Reserve), Senior Medical Officer (Grade 1), Nigeria, to be a Principal Medical Officer in Nigeria; A. C. Parsons, M.R.C.S.Eng., L.R.C.P.Lond., D.T.M.Liv., Medical Officer, Nigeria, to be a Sanitary Officer in Nigeria; W. J. D. Inness, M.R.C.S.Eng., L.R.C.P.Lond., D.P.H.Ire., Medical Officer, Nigeria, to be a Sanitary Officer in Nigeria.

Resignation.—H. McC. Hänschell, M.R.C.S.Eng., L.R.C.P. Lond., D.T.M.Liv., D.T.M. & H.Camb.

Retirement.—J. R. P. Allin, L.R.C.P. & S., L.M.Irc, D.T.M. Liv., retires with a gratuity.

New Appointments.—The following gentlemen have been selected for appointment to the staff: J. J. Baeza, M.B., Ch.B. Glas., Gold Coast; N. S. Deane, L.R.C.P. & S.Ire., Sierra Leone; J. C. Watt, M.B., Ch.B.Glas., Sierra Leone; J. T. Watt, M.B., Ch.B.Aberd., Nigeria; T. B. Fraser, M.B., Ch.B. Aberd., D.P.H.Cantab., Nigeria; A. S. Burgess, M.R.C.S.Eng., L.R.C.P.Lond., M.B., B.C.Cantab. Gold Coast; E. Gibson, L.R.C.P. & S.Edin., Nigeria; C. J. B. Pasley, M.R.C.S.Eng., L.R.C.P.Lond., Nigeria; T. Ryan, M.B., Ch.B., B.A.O.Dub., Gambia; C. Mackey, M.B., Ch.B.Vict.Univ.Man., D.P.H., D.T.M.Liv., Nigeria; J. M. O'Connell, L.R.C.P. & S.Ire., Sierra Leone.

Other Colonies and Protectorates.

J. R. Dodd (Colonel, R.A.M.C.) has been selected for appointment as Medical Officer in charge for Ankylostomiasis work in Trinidad.

C. G. H. Campbell, M.R.C.S.Eng., L.R.C.P.Lond., has been selected for appointment as Assistant Medical Officer for Ankylostomiasis work in Trinidad.

A. Kidd, M.B., B.Ch., B.A.O.Dub., has been selected for appointment as House Surgeon of the Victoria Hospital and Bacteriologist in St. Lucia.

R. S. Taylor, M.R.C.S.Eng., L.R.C.P.Lond., M.B., B.C. Cantab., has been selected for appointment as a temporary Medical Officer in Uganda.

N. Crichlow, M.B., Ch.B.Glas., has been selected for appointment as a Medical Officer in the Solomon Islands Protectorate.

W. M. W. Shepherd, M.B., Ch.B.Edin., has been selected for appointment as a Medical Officer in Zanzibar.

A. L. Fitzmaurice, M.R.C.S.Eng., L.R.C.P.Lond., M.B., B.S.Lond., has been selected for appointment as a Medical Officer in Somaliland.

E. H. Black, M.B., Ch.B.Edin., D.P.H.Camb., has been selected for appointment as a Medical Officer in the Federated Malay States.

P. W. H. Burne, M.B., B.S.Lond., has been selected for appointment as a Medical Officer in the Straits Settlements.

ERRATUM.

INADVERTENTLY the name of Dr. H. Harold Scott was printed as *H. Harold Salt* on p. 253 of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE on August 15, 1914, in a report of the discussion on "Vomiting Sickness of Jamaica" in the Tropical Section of the British Medical Association.

Original Communications.

DRACONTIASIS OR DRACUNCULOSIS: A REVIEW.

By R. E. McConnell, B.A., M.D.C.M., D.T.M.
Colonial Medical Service.

Definition.—A disease caused by the presence in the body of *Filaria medinensis* (synonyms *F. persarum, Dracunculus medinensis, D. persarum, F. dracunculus, F. æthiopica, Vena medinensis, Gordius medinensis*), commonly known as the Guinea-worm.

History and Geography.—Cobbald, Bartholini and Kirschenmeister believe that the serpents of fire spoken of in the Old Testament at the time of Moses were Guinea-worms. The earliest definite reference, however, is by Plutarch. He quotes a writer of the second century B.C., who reported it as occurring on the shores of the Red Sea. Later Leonidas, in the second century A.D., mentions it as occurring in India and Africa.

It would be difficult to prove whether Asia or Africa was the original home, although some circumstances point to its being the latter continent.

On the West Coast the disease is indigenous in the countries extending from Senegambia to the Kameruns, although in the latter area it is said not to be common. Clemow states that it is rare and probably not indigenous in the Congo. Roux says that it occurs in the Portuguese Colony, Angola. It is found in British East Africa, and is common in the Nile Province of the Uganda Protectorate. It occurs in parts of Abyssinia and is endemic in Kordofan, Darfur and Nubia. Cases are seen in the countries bordering on the Mediterranean, but these are believed to be imported.

In India the disease is very common. It is most frequently met with in South Eastern India, Rajputana, Central India and Gujerat; is common in Deccan; but not absent from any geographical division of the Peninsula. It is rare only in the North West Provinces, in Lower Bengal, and the Coast belts of the Madras Presidency.

Clemow has stated that in Ceylon it is also of frequent occurrence, but Castellani and Chalmers, both resident in this island, say that in spite of many cases being imported from India, there is no evidence that it spreads there. W. Carnegie Brown states that cases are frequently imported into Malaya, but that the disease is never contracted there.

It is endemic on the southern shores of Persia. In Arabia the disease is common. Curiously enough at Medina (which takes so prominent a part in the nomenclature of the disease) it is said to be comparatively rare, while it is especially common in Arabia Petrea, and the coasts of Hedjaz and the Yemen. It has also been found in Syria.

In Turkestan it is not common, but in Russian Turkestan it is more widespread (especially in the Jisakh and Karshi districts). Castellani and Chalmers state that it is known in the Fiji Islands.

For the most part cases reported from both North and South America have been imported, but Osler reports two cases from the United States, and there is said to be a small endemic centre in the province of Feira de Santa Anna, Bahia, Brazil.

The small number of cases reported from Europe have been without exception imported.

The adult female is a long, smooth-surfaced, milk-white, cord-like cylindrical worm. Its colour is due to the mass of embryos it contains amounting to several millions. On expressing these from any portion of its continuity it assumes a dull translucent whiteness. Davidson says that of forty specimens the shortest was $12\frac{3}{4}$ in. and the longest 40 in.; the great majority have been in my experience from 25 in. to 35 in. in length. The diameter is about $\frac{1}{32}$ in.

At the head end it narrows somewhat and then ends in an oval-shaped, bluntly rounded surface, the "cephalic shield." In the centre of this is a small two-lipped mouth. Near the buccal opening are two papillæ, one dorsal and one ventral, while near the circumference of the shield are six smaller ones, two lateral and larger, and four submedian. These are sensory organs with nerve-endings in a little depression at the apex of each.

The mouth leads into an alimentary canal which is straight, atrophies toward the tail end, and ends cæcally. The vulvar orifice is placed externally to the papillæ. A vagina joins it to the uterus which when distended by embryos occupies practically all the body cavity and extends almost to the tip of the tail. It tapers towards the tail and ends in a small hook-like process. The male, as recovered from Leiper's monkey, is only about 22 mm. long, but is probably double this length when adult. It presents five pairs of post-anal papillæ.

The embryo is a short flattened body some $\frac{1}{50}$ in. long and about $\frac{1}{1000}$ in. at its broadest part. The anterior or head end is rounded while the posterior end is produced into a very narrow tail. At the head end is situated the small three-lipped mouth which leads to a comparatively large alimentary tract. This extends through about three quarters the length of the embryo and probably ends cæcally. Near the root of the tail a little sac is placed on each side. The body surface is markedly striated.

Cyclops.—It is considered convenient to discuss this little animal here, as it will be later referred to in its capacity as intermediary host. It belongs to the *Phylum arthropoda*, order Copepoda. There are both salt and fresh water forms, the latter alone, as far as is known, being inculpated in the transmission of the disease under discussion. It is a small animal with a cephalothorax, thorax, and abdomen. On the cephalothorax are: (1) A central eye consisting of two or more eye-spots; (2) two pairs of antennæ, the anterior the longer, and both acting as natatory organs; (3) a pair of mandibles; (4) two pairs of maxillæ; and (5) a pair of maxillipeds. The thorax has five segments, each (or sometimes only the first four) having a pair of swimming legs. The abdomen is reduced and has five segments with an anus at the posterior end.

Life-history. — The adults are found in the

connective tissue, more particularly that in proximity to the mesentery. Copulation takes place here and probably the males die off soon afterwards. The fertilized female then endeavours to reach the surface, choosing for the point of exit some part which will be likely to be exposed freely to water, a phenomenon which may be called *hydrotropism*. A worm which has assumed a subcutaneous position has been observed to move several inches in a day.

Eventually a funnel-like opening in the skin forms, ¼ in. to ½ in. in diameter, at the bottom of which lies the head somewhat pushed to one side in order that the vulvar orifice with its prolasped uterus may present. If now a little water is poured over this spot a clear or translucent fluid, which later becomes more opaque, is seen to exude from the prolapsed uterus which under the microscope is found to consist of very many active embryos.

Leiper, whose work on this subject has been most interesting, says that natural evaporation of their watery habitat causes immediate death, and that they cannot be resuscitated.

Leuckart, on the other hand, has stated that unless complete desiccation has taken place the life processes may be resumed. Sea and brackish water also kill the embryos.

Leiper has found that the embryos live from four to six days in ordinary water, and a day or two longer in muddy water. A few more days are allotted to them by some observers. The site of presentation is usually on or near the foot, so that when the unshod host enters streams or pools these become polluted. If the little cyclops exists in such waters it is then found that the embryos are ingested by it and make their way from the intestine into the cœlom. No other pond animal has been found capable of acting as an intermediary host. Development then takes place in the cyclops. In the early days some alimentary tract changes take place. Between the eighth and twelfth days it sheds a striated cuticle, gets rid of its long swimming tail, and in a day or two later, according to Leiper, a very delicate enveloping covering. They also become cylindrical in shape.

No further ecdysis occurs, the subsequent changes consisting of the differentiation of internal structures. In the fifth week the larva becomes mature. Leiper kept some two weeks longer but observed no further change. Some of the cyclops, however, died with their parasites. Fedschenko has observed that twelve embryos did not inconvenience the host, but Leiper found that six brought about death. During the first two weeks the parasites are quite active, but then become quiescent. If when the larva is mature the cyclops is placed in a solution of '2 per cent. HCl, the equivalent of the acidity of the stomach secretion, the host dies but the parasite becomes very active, gains the body cavity, and finally makes its way through one of the openings (Leiper). Having made its escape it swims actively about. The next step then in nature is that man drinks water containing cyclops with mature larvæ; these latter escape in the stomach, make their way through the wall of the alimentary tract, and in the adjacent tissue develop into the adult worms. No other mode of infection is now countenanced by investigators.

Manson has indeed reported that four European officers, who both boiled and filtered the drinking water, but who bathed in dirty water, contracted the disease. One frequently, however, gets water in the mouth while swimming, which forms an adequate explanation of such cases.

Course of Disease.—The time intervening between the ingestion of the larva and the appearance of the mature embryo-bearing female at the surface of the body is in the neighbourhood of one year. Manson saw two cases in London in May—the patients had been shooting together in the Nile Province of the Uganda Protectorate during the previous May. Powell reports that sixteen gentlemen and five servants left Bombay on April 20, 1912. They remained away two days and drank unfiltered water from a well. On April 2, 1903, a Guinea-worm appeared in the leg of one of the gentlemen, and between this date and May 20, 1903, five other gentlemen and one servant were attacked, making seven cases in all. The shortest intervening period in these cases was 345 days, the longest 435, while the majority of the eighteen worms which appeared presented in a year and two or three weeks. Davidson gives the intervening period as nine to twelve months, but says that it may be two years. W. Carnegie Brown (Penang) states that he has seen cases develop in the Malay States eighteen months after arrival, and remarks that although cyclops exist in that country the disease does not spread. Leiper fed a monkey on bananas smeared with five weeks' old embryos contained in cyclops, and six months later a *post-mortem* disclosed three immature unimpregnated females some 30 cm. in length, and two small males 22 mm.

In Guinea-worm districts one occasionally meets with sudden painful swellings, usually in the lower extremities, which one is inclined to ascribe to reaction following the premature emission of embryos. The worm on reaching the skin does not always pierce it immediately, but may do considerable subsequent travelling.

Neveux, in referring to worms which do not pierce the skin, places them under the following categories:—

(1) Those living beneath the skin exhibiting no desire to emerge; they may live a long time. This information was gleaned from native sources.

(2) Those dying in this situation and neither being absorbed nor escaping. He cites a case in which such a worm had existed for ten years, and was as thick as a pencil.

(3) Those becoming cysts. These are ovoid, the size of a hen's egg: some are fluctuant, others hard. These were observed to follow the appearance of Guinea-worms. I have never heard of or seen anything suggesting category (3) and I doubt whether an adequate examination of such cyst has ever been made.

In making its way towards the surface the worm bores through the tissue spaces, but adopts another means of perforating the skin. Either from a reaction set up by virtue of its qualities as a foreign

body, or (which is more probable) from the secretion of an irritating substance, the epidermis is raised by an accumulation of fluid until either its own attenuation or some outside agent causes it to break. It is not likely that embryos are extruded until expulsion is incited by contact with cold water. At the apex of the somewhat crater-like resultant sore the head of the worm may now be detected.

Symptoms premonitory to the appearance of the worm are seldom observed in practice. One does not often see a case before the actual rupture of the skin, and the patients being, for the most part, in Africa at least, people of limited intelligence this testimony is unreliable. My opinion is that premonitory symptoms are not the rule; nevertheless, they have been not infrequently described and are probably more common in Europeans. Dudgeon and Child cite a case from India where twelve months after exposure to infection there was pain and swelling in the foot, but the worm did not present until a month later, although there had been a small black spot on the site of presentation some two weeks previously. Powell states that he found some fever a few days before the worm was palpable, and in two cases there was swelling of the face and hands even when worms presented in the legs. Manson states that there is sometimes urticaria, and a little fever when it comes to the surface.

Siberry reports a case in a European where the foot was swollen for five weeks, there being no pain or redness or constitutional disturbance: the skin between two toes then became red hot and tense, there being no fluctation; next day this burst emitting first a yellowish and then a sanguineous fluid. On the following day a pale fluid continued to escape; the base offered a small punched out appearance, and then the worm presented.

In my European case he noticed, about December 26, 1913, that a dull ache such as he would have expected from a varicose vein set in near the right shin, after playing tennis or undergoing other exertion. From December 30, 1913, to January 12, 1914, he was on "safari." On the evening of the 14th the leg became very itchy, and before going to sleep a small blister appeared. He broke this during the night by scratching, and next day was dressing the resulting sore when about ½ in. of worm suddenly appeared which he broke, thinking it was the "core" of an abscess. Following this numerous small pieces came away, but he did not lie up. When he judged most of the worm to be out he went on safari again. The wound healed, but a few days later great inflammation set in necessitating extensive incisions and lying up for nearly three weeks.

On March 4 a small sore, surrounded by painful extensive inflammation, appeared on the other leg, near the ankle. He attributed this to an infected scratch, the onset being so dissimilar from that of the other Guinea-worm that the idea of its being a second one was dismissed. He could not put his foot to the ground. The inflammation on rest subsided, leaving a crater-shaped depression, at the bottom of which a Guinea-worm presented. In the course of a week this was gradually extracted piecemeal. About three weeks later severe inflammation set in in the anterior tibial group of muscles. It was at this time that I saw him first. Some ten days' rest and treatment left him with a sound member. It was impossible to place the exact date of infection as he had been stationed on the Nile Province for over a year, and had left Gondokoro for Europe on the previous May 11.

In a great many cases seen in West and Central Africa I have only recognized two worms above the knee, one in the thigh and one in the scrotum, and neither of these had perforated the skin. These were both palpable for their entire length in their subcutaneous position, and were the only two I met with which admitted of extraction at one sittting. The overwhelming majority of cases present in foot and ankle. Manson states that in 85 per cent. of the cases the presentation is in the feet and legs, but I am satisfied this percentage should be larger. Manson also states that in the few Europeans he has seen they presented in the body, scrotum and thigh. One would expect to find among the clothed and booted Europeans more diversity in the sites of presentation than among his scantily clad dark-skinned fellow men, as the worm in its search for an exit likely to be exposed frequently to water is placed at a distinct disadvantage among the former.

Presentation in the head has also been known.

Among Indian water carriers it is not uncommon to find that the worm seeks the back, a clever adaptation on its part to circumstances.

The worm discharges embryos for two to three weeks, during which time, if uncomplicated, there should be no constitutional disturbance. If, however, the worm during extraction is broken as it lies among the tissues, the internal emission of embryos sets up a serious reaction, which may go on to abscess formation. This, of course, is more probable when the channel in which the worm lies has already become infected. Among careless natives such suppuration is very common. The pus very often has both the consistency and colour of anchovy sauce. In old suppurative cases the accessible part of the worm becomes filled with white cells which destroy the embryos.

As many as fifty worms have been found in one patient: three to five are by no means uncommon.

Economic Importance.—Death, direct or indirect, is an extremely rare result, but the disease frequently lays a heavy hand on village communities, where nearly every member may be temporarily incapacitated in varying degrees for work.

Manson reports an epidemic which occurred in a column of soldiers at Old Calabar, in 1904, where 15 per cent. of the men were affected. On this occasion it was found necessary to requisition the service of an additional company of men from Lagos to carry out the work of the expedition.

Graham reports, from the Northern Territories of the Gold Coast, that among an average force of 350 men, 57, or 16·28 per cent., suffered from the disease in the course of a year. The number of days spent in

hospital aggregated 1,304, or an average of 22·8 per patient. More loss of time was caused by this disease than any other. At one time the Indian Army had almost 5 per cent. annually affected. Occasionally the worm enters a joint-setting up an arthritis, which may limit the usefulness of the member. Rarely, too, the suppurative inflammation, which not infrequently in natives is set up in the immediate neighbourhood of the worm, when extensive enough leaves troublesome contractures. Such destructive inflammation may also extend to the bones, especially in the region of the feet.

Periodicity.—In an endemic centre cases are seen during every month of the year. Nevertheless, there is relative periodicity which lends itself to explanation. Pools, open wells, and the reeded edges of streams are the usual sources of infection. Immediately before the rains the pools and wells are at their lowest, and the streams are sluggiest. It follows that the cyclops are densest. In addition, these little animals are usually more numerous near the bottom of water supplies. As the rainy season in most tropical countries appears annually with only a negligible variation in the date, one would then expect the greatest number of cases, taking the average hidden life of the worm at one year and a few weeks, to appear about the beginning of the following rains. This is what actually occurs. Rodrigues and Neveux in Senegal, say that it always appears there during the rains. Leuckart, from Indian statistics, has concluded that the disease most frequently manifests itself in the two months at the end of the dry and beginning of the wet seasons. But, curiously enough, Graham's figures from Gambaga show that in that region the two months previous to the rains formed the period of greatest incidence.

Prophylaxis.—It will now be evident that any preventive measures must be directed towards the exclusion of cyclops from household water. Boiling and filtering are certain prophylactic measures, but one cannot hope to induce native communities to adopt such radical measures.

Fortunately, simply straining through cotton is effective, and there is no reason why this should not be universally adopted among such people.

On the West Coast of Africa communities have changed the source of their water supply at great inconvenience to themselves in order to avoid contamination, while others have built new villages at a distance—a not infrequent custom with some tribes when they have been visited by any epidemic. Such measures show wisdom, but infection is too often carried to the new supply. If the mechanism of the dissemination of the disease was simply and adequately explained to them, I feel confident that they could be relied upon to carry out the straining process. Covered-in wells, properly constructed, would be an alternative, and probably more reliable measure. Villages on a reed-free stream with a moderate current should be exempt.

Treatment.—After emitting embryos for some time, the worm protrudes slightly. Before this occurs, unless the worm lies subcutaneously, it is useless in my experience to adopt any measure other than frequent application of water in order to hasten emission of embryos coupled with antiseptic dressing. Formerly, it is said that in India natives used a trumpet-shaped tube to suck out the worm in order to hasten its exit. Horton says that asafœtida kills the worms and prevents inflammation. Fox in his case combined this with cataplasms, and in five days found that the worm had come out. Faulkner sends a current of electricity through it. After some discharges he claims that the parasite comes out whole. Others have advocated the injection of the worm with some poisonous substance, such as perchloride of mercury. After the partial protrusion, all native peoples have adopted some means of exercising traction. Some Arabs have attached a piece of lead to the worm; in India they have attached a bunch of leaves or grass to it, after which they swam or waded about in water. By far the most universally adopted method among such people is to wind the worm on a piece of wood, tying it in a position so that it will not recede, and resuming the pulling process after an interval. The great danger of such methods in careless hands is the rupture of the worm in its course among the tissues. The common measure among European practitioners in the Tropics is, after thoroughly douching with water, to combine massage with gentle traction, and then to apply a moist antiseptic dressing, this operation being repeated daily until complete extrusion has occurred. In cases where it lies subcutaneously, one cuts down on the centre of the worm and by running a broad tape around it exercises gentle traction. It is only in such cases that one may hope to secure a good specimen. Two incisions are sometimes necessitated by the intricate looping of the central position; even then a rupture may follow excessive traction. In this subcutaneous situation, however, it has not the ugly consequences of a rupture in the deeper tissues.

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THE JOURNAL OF

Tropical Medicine and Hygiene

NOVEMBER 16, 1914.

THE CHAIR OF TROPICAL MEDICINE IN THE UNIVERSITY OF NAPLES.

DR. ALDO CASTELLANI has been offered and has accepted the recently created Chair of Tropical Medicine in the University of Naples. He has also been appointed Director to the Royal Clinique for Tropical Diseases in the City of Naples. The wisdom of the choice of the University authorities in Naples will be apparent, for no man at the present day in any country is better equipped for the high and important duties attached to a chair of tropical medicine than Dr. Castellani. The establishment of this chair is an important event, for Naples is in touch with semi-tropical and tropical countries in a way that few other cities in Europe are, and affords an opportunity of studying tropical diseases in Naples first hand, as it were, and before the chronic stages are reached. The other European tropical schools are far north—London, Liverpool, Hamburg, Paris, &c.; but Naples being in a warmer zone and on the highway of the Mediterranean affords opportunities that render it a pre-eminent centre for collating those stricken with tropical ailments, whether Italians or those of other nationalities. Moreover, Italy with its North African possessions is kept in immediate touch with fresh cases of disease frequently of a tropical character.

When the establishment of a tropical school in this country was first publicly brought forward by Mr. Cantlie at the Imperial Institute in 1898, Sir Joseph Fayrer discussed the question, raised by the late Dr. Thin, of a tropical school at Rome or Naples. The suggestion did not find favour at the time, no more did the establishment of a tropical school at Calcutta. Now Calcutta has its school and Italy has its school, the early dreams of the pioneers of tropical education being thus fulfilled.

Wise in the creation of a school in Naples, the Senate of the University is to be further congratulated on their forethought and wisdom by dignifying the department of tropical medicine as a university chair. In London, with its confusion of medical organization, with a university which is wholly dissimilar to that in any other town or country, the title of professor is not granted to holders of chairs in any department of tropical medicine; in Liverpool, however, where a university on recognized lines exists, this is the case, and we are glad to see the Neapolitan authorities have done likewise.

Dr. Castellani's work, his powers of observation, his accuracy, his methods and scientific acumen, are well known to all workers in tropical medicine. His momentous discovery of the presence of the trypanosome in sleeping sickness in man and the many, many additions to our knowledge since he went to Ceylon, have earned him a world-wide reputation of unassailable distinction.

The loss to Ceylon by the departure of Dr. Castellani will be deeply felt. Not only will the college regret his resignation and feel the serious loss of this distinguished member of its teaching staff, but the community of Colombo have on all occasions expressed publicly and privately the value of Dr. Castellani's services to themselves individually. Recently Dr. Chalmers, Dr. Castellani's valued colleague and joint author with him of the magnificent "Manual of Tropical Medicine," left Ceylon for the Sudan, and the departure of these two distinguished men is a loss to the colony which cannot be easily, if ever, wholly repaired.

We extend our hearty congratulations to Dr. Castellani upon his appointment, and we sympathize with the feelings of regret which the community of Ceylon have expressed at losing him. Dr. Castellani has made Colombo a centre of skilled medical advice to all travellers in tropical Asia, and we are convinced

that on returning to his native land Dr. Castellani will make Naples a great centre of scientific and clinical tropical medicine throughout the Mediterranean shores and prominent amongst the tropical schools of the world.

Annotations.

Note on Limitation of the After-pain of Quinine Injections.—A. G. Peter, of Prestea, West Africa, writes (*Lancet*, October 24), that patients, where they have any choice, naturally prefer a practitioner who has not the reputation of advocating this line of treatment, and so greatly do some people dread the after-pain of quinine injections that they will resort to every kind of subterfuge to avoid them. To avoid this he used quinine and urea hydrochloride tablets, and found a conspicuous absence of any after-pain when this drug was used. By trial the smallest amount required to ensure comfort afterwards was found to be ½ gr. of quinine and urea hydrochloride compound. The points to be noted are: (1) A ½ gr. tablet of quinine and urea-hydrochloride appears to be sufficient to remove the after-pain of quinine injections. (2) One tablet is added to the amount of quinine to be given, between 10 and 20 gr. of bihydrochloride, about 2 c.c. of water are then added, and the boiled solution received into a sterile 2 c.c. syringe for injection. (3) The solution is equally efficacious when boiled, but in too concentrated solution is apt to block the needle if not given at once.

Early Operation for Gall-stones.—J. C. Hubbard (*Boston Med. and Surg. Journ.*, June 18, 1914) has reviewed the conditions found in 108 autopsies on bodies in which gall-stones were found; some had been recognized, some suspected, others unrecognized. Gall-stones were found in the gall-bladder only in 76 cases. Gall-stones caused the death of nine of these patients by setting up fatal trouble in the liver or gall-bladder. The causes of death were: hepatitis, cancer of the gall-bladder, pancreatitis, abscess of the liver. Sixty-seven died from conditions not connected with gall-stones. There were 32 cases where the stones had passed beyond the gall-bladder, and were found in the ducts. In 14 of these the cause of death was due to the gall-stones. The causes were given as abscesses of the liver, peritonitis, cholangitis, abscess of bladder, cholecystitis. In 4 out of the 108 cases a stone was found which had ulcerated through into the intestine. The relative mortality between gall-stones in the bladder and those that have passed into the ducts is of special interest. The mortality from gall-stones in the gall-bladder is, without operation, 14 per 100; 3 to 5 after operation, increased to 43 per 100 when the stones are in the ducts. The deduction is obvious that advice for operation should follow the establishment of a diagnosis before the stones have had time to set up any secondary changes calculated to lead to a fatal result.

Acetyl-salicylic Acid in Treatment of Asthma. G. Jepsen (*Ugeskrift for Læger*, Christiania, August 20, lxxvi, No. 34, pp. 1449-1494) has suffered from asthma himself and has found great relief from acetyl-salicylic acid, as also a number of patients, as he describes in detail. The dose was 1 grm. (15 gr.) and it always helped at once and has served to ward off impending attacks. Some of his patients have been thus taking it for two years, one for three. In some other cases no benefit was apparent from it and only epinephrin gave relief. All had a vasomotor rhinitis which suggests that reflex action from the nose may be an important factor in asthma. Treatment of the rhinitis is thus an indispensable preliminary to treatment of the asthma. The asthma subsided completely during acute inter-current diseases in his patients.

Disappearance of Typhus, Relapsing Fever and Plague from Civilized Countries (K. Kisskalt, *Deutsche medizinische Wochenschrift*, Berlin, August 6, xl, No. 32, pp. 1601-1648).—The recent discovery that typhus and relapsing fever are transmitted mainly if not exclusively by the louse readily explains their vanishing from a country as habits of cleanliness exterminate vermin. This also has co-operated in the disappearance of bubonic plague, as fleas and rats have been brought under some control. Another important factor may be the fact that the black rats have been driven out of Western Europe in the last century or so by the brown rats which are not so tame as the black house rat. There is a disease among rats in Europe which causes chronic lesions almost identical with those of plague in rats. It is caused by the *Bacillus pseudotuberculosis rodentium*, and this resembles the plague bacillus so closely that there is much to sustain the assumption that this is the degenerated descendant of the original bacillus of virulent rat plague in former centuries, modified by countless passages through rats.

Protective Ferments against Maize-albumin in Serum of Pellagrins (*Deutsche medizinische Wochenschrift*, Berlin, August 6, xl, No. 32, pp. 1601-1648).—Nitzescu, of Bucharest, calls attention to the possibility of early serodiagnosis of pellagra by the presence of protective ferments against maize albumin—zeinolytic ferments. The maize albumin or zein seems to have a toxic action, and the ferments formed to combat this linger in the blood long after other symptoms have disappeared when maize is dropped from the diet. In a recent case a patient with merely nervous manifestations was shown by the serodiagnostic test to be suffering from otherwise latent pellagra, and later other characteristic symptoms developed. The response was particularly pronounced in eight cases with predominant gastro-intestinal disturbances. The reaction was negative in the fifty-eight cases only in two pellagrins who had been in the hospital for over two years and had eaten no maize during this time and had no symptoms left except slight mental confusion at times. The zein was extracted according to Osborne's directions and the Abderhalden ninhydrin technique was followed otherwise.

Abstracts.

HÆMORRHAGE LATE IN TYPHOID FEVER.

By Braillon and Bax.*

We distinguish this disease from intestinal hæmorrhage due to the specific ulceration of the bowel, and early severe, malignant hæmorrhage, similar to that which occurs in other infections. The late occurs during defervescence or convalescence in cases which have given no indication of unusual severity. It usually lasts about six to eight days, ending most frequently in recovery.

A girl, aged 16, was admitted on October 28 to hospital with a fifteen days' history of illness, without previous hæmorrhage. The temperature was 104° F., the pulse 80, the urine was clear, rose spots were present on the abdomen, and Widal's reaction was positive at 1 in 50. On November 7 the temperature began to fall and convalescence seemed imminent.

On November 11 the urine was slightly red. On November 13 there was slight bleeding from the gums, and the urine was more highly coloured. In the evening epistaxis occurred, and the bleeding from the mouth and gums continued. A mixture containing chloride of calcium and ergotine was prescribed. On November 14 considerable intestinal hæmorrhage occurred, and the oozing from the gums continued. The urine contained much blood. The temperature was normal, but the pulse was 120, and very small, and the skin and mucous membranes were very pale. She was given caffeine and a hypodermic injection of serum with 0·04 grm. of emetine hydrochloride. On November 15 the bleeding from the nose and mouth continued, as did the hæmaturia, but there was no further hæmorrhage from the bowel. The patient was in a state of torpor and appeared almost exsanguine. The pulse varied from 130 to 140 and was almost imperceptible, while the temperature had fallen below 98·6° F. An injection of 500 c.c. of saline solution was administered subcutaneously. In the afternoon she was in a precarious condition, and as hæmorrhage continued blood was transfused. The connection was maintained for forty-five minutes, by which time the donor had become pale and rather faint. The patient felt better and showed slight colour in the cheeks, while her pulse fell to 100, but was still very small. Next day she showed marked improvement, the skin and mucous membranes being well coloured, the pulse 90, well filled, and the temperature 101° F. The bleeding from the nose and the gums had ceased, and the hæmaturia was less marked than before the transfusion. The bleeding from the gums recurred during the night, and on the following day the hæmaturia again increased. In the afternoon she vomited a large clot of dark blood. An injection of 0·04 grm. of emetine hydrochloride was again administered. On November 18 hæmatemesis recurred, and the oozing from the gums continued in spite of the application of perchloride of iron. The hæmaturia was also very abundant. The forearm at the site of transfusion had become œdematous, and on exposing the wound a soft clot protruded. In the afternoon profuse bleeding occurred from the wound and could not be entirely arrested. Next day her condition appeared to be hopeless. The oozing from the wound and from the gums continued, as well as marked hæmaturia. The pulse was 160 and almost imperceptible. A slow instillation of 500 c.c. of saline solution containing forty-seven parts of glucose in 1,000 was given by the rectum. This was replaced in the afternoon by a saline solution containing 1 per cent. of gelatine, of which a litre was given during the afternoon and evening with perfect tolerance. A hypodermic injection of 10 c.c. of electrargol and another dose of emetine were also given. On the following day the temperature was 100° F. and the pulse 120. The hæmorrhages had ceased suddenly and simultaneously during the night. The gums were almost normal, and the urine was clear and free from blood by chemical and microscopical examination. Another 500 c.c. of glucose solution was given by the rectum. Next day the improvement was maintained and no further hæmorrhage occurred. She gradually regained strength, and left hospital on January 24.

The writers made detailed blood examinations, including differential counts, and point out the unusual severity of this rare condition and the failure of the transfusion of a large quantity of blood to arrest it. The striking arrest of the hæmorrhages by the instillation of gelatine in saline solution *per rectum* shows the value of this method.

* Abstracted from *Bull. et Mém. de la Soc. méd des Hôp.*

THE IMPORTANCE OF RECTAL EXAMINATION.*

By C. O. Hawthorne, M.D.

Rectal examination ought not to be omitted in any instance of abdominal tumour or dropsy, persistent or recurring abdominal pain, tenesmus, obstinate sciatica (especially if bi-lateral), and of continuing diarrhœa on the one hand or constipation on the other.

Case 1: *Severe and Recurring Abdominal Pain relieved by Rest; no Physical Signs in Chest or Abdomen, but a Malignant Tumour found* per rectum.—A man, aged 40, for many months complained of dyspeptic symptoms and constipation with, more recently, severe pains in the lower abdomen. Under rest these symptoms had been relieved, but on returning to his work as a music-hall performer they recurred, and the pain in particular had been extremely severe; at no time had there been any blood in the stools. Physical examination of the abdomen showed nothing abnormal, but a considerable malignant growth was readily recognized *per rectum*.

Case 2: *Symptoms of "Colitis," in a Woman, aged* 28, *due to a Malignant Growth in the Rectum; Abdominal Examination Negative.*—A woman, though only aged 28, was the victim of a malignant growth in the rectum. She had for several months been under

* Abstracted from the *Polyclinic*, August, 1914.

treatment for "colitis" (frequent action of the bowels and some abdominal pain), but hardly regarded herself as seriously ill. To rest on a diagnosis of "colitis" until thorough and repeated attempts have been made to exclude all gross forms of organic disease is unsafe.

Case 3: *Diarrhœa for some months in Man, aged 74; no Obvious Failure of Health and no Physical Signs in Abdomen; Rectal Examination Negative, but Tumour discovered by Sigmoidoscope.*—A man, aged 74, for six months had to go to the w.c. some ten to twenty times a day, the stools containing mucus, and, at times, a little blood. He had undergone various methods of treatment for "colitis," but without benefit. The patient protested that his general health was "quite good," and denied that he had lost flesh. He appeared to be a vigorous and hearty old man. Rectal examination was negative, but with the sigmoidoscope a considerable growth was detected in the sigmoid flexure.

A negative rectal examination with the finger is not sufficient finally to exclude a malignant growth; the sigmoidoscope is necessary to make such exclusion absolute.

Case 4: *Enlargement of Liver of Doubtful Nature; Malignant Ulcer in Wall of Rectum.*—A man, aged 52, had considerable enlargement of the liver. It was doubtful whether this was due to malignant disease, cirrhosis, or abscess of the liver. The discovery of an ulcer with thickened edges and base in the wall of the rectum settled the question.

Case 5: *Ascites without other Evidence of Disease; Discovery of Malignant Growth on Rectal Examination.*—A middle-aged woman complained of abdominal distension which was found to be due to extreme ascites. The chest was normal. The urine was free from albumin. There was some œdema of the lower limbs, but this could be accounted for by the pressure of the ascitic fluid on the abdominal veins. As for the abdominal organs, a confident opinion could not be given as the abdomen was full of fluid. Still, there is a presumption that ascites in an adult, and unattended by other evidences of disease, means cirrhosis of the liver. This view had been accepted; but on rectal examination a considerable tumour could be felt through the anterior wall of the rectum. After paracentesis several similar tumours were found in other parts of the abdomen, and the diagnosis was plainly malignant disease.

Case 6: *Obscure Abdominal Pain following Febrile Attack; Visible Intestinal Peristalsis; on Rectal Examination discovery of Impacted Ovarian Cyst.*—An unmarried woman, aged 30, had what seemed to be some simple febrile disturbance for ten days. Soon after defervescence she began to lose flesh and suffered from short but severe attacks of spasmodic pain in the lower abdomen. It was difficult to bring these symptoms into relation with the earlier febrile condition, and no physical changes could be detected in the abdomen. But on one occasion it chanced that she was seen during an attack of pain, and then on exposing the abdominal wall peristalsis was seen. This showed that somewhere in the lower intestinal area there existed some form of mechanical obstruction. On rectal examination a considerable tumour was found in the pelvis. It proved to be an ovarian cyst firmly adherent to the surrounding structures, and it was afterwards successfully removed. A small collection of recently formed pus was found, and it may be that to this the original febrile attack was due.

THE SURGERY OF THE SUBPHRENIC SPACE.*

By Fred. D. Bird.

The level of the subphrenic space alters with alterations of the diaphragm, and it may be much raised without our being able to say that there is anything wrong with it; *e.g.*, I have seen a very large hepatic hydatid cyst force the diaphragm up to the level of the third and even of the second rib, without impairing the integrity of the space. In the opposite direction the space may be depressed by pleural conditions, *e.g.*, effusions, empyema.

As a rule the space is at a lower vertical level on the left side than on the right, but dilation of the stomach may be so great as to equalize the levels. The position of the diaphragm is best arrived at by the aid of the fluorescent screen. The space may be traversed by tumours and inflammations with but little harm to it; *e.g.*, a hydatid on upper surface of the liver discharging into a bronchus, and adhesions may be present after operation without any discomfort to the owner. I have several times examined cases after the transpleural operation, and have seen the shadow of the diaphragm distorted at the site of the operation. The space on the right side may be obliterated, wholly or in part by disease, causing adhesions between the upper surface of the liver and the under surface of the diaphragm. The commonest cause of dense adhesions in this position is syphilis.

Gumma of the liver is apt to give rise to adhesions of the peritoneal surfaces of the space; the recurring pains over the liver region experienced by old tertiary syphilitics are generally to be interpreted in terms of adhesions between the liver and the diaphragm. Nature, as well as the surgeon, occasionally fill up a portion of the space with fringes of omentum.

Carcinomatous aggregations will sometimes cause adhesions by their raised periphery, and the interior being filled with serous fluid a most puzzling condition results.

In performing transpleural operations, the nearer the surgeon keeps to the costal cartilages the more likely will he be to strike the apposition of the two pleural surfaces. This has three advantages: first, that it is technically much easier to enter the abdominal cavity in this situation; secondly, that no collapse of the lung can take place; and, thirdly, and most important, that sepsis is much less likely to spread into the general cavity of the pleura. *Per contra*, the mid-axillary line, unless at the costal margin, is the worst place in which to open the pleura

* From the *Medical Journal of Australia*, July 4, 1914.

preparatory to opening the peritoneum. Hydatid on the upper surface of the liver of size sufficient to cause symptoms without suppuration, can be attacked as a rule transpleurally by removing a portion of costal cartilage or rib adjacent to it. The greatest importance is attached to this choice of position in transpleural operations. In pursuance of this I have on two occasions operated too far forward to hit the hydatid, which was of moderate size. Except for loss of time, no harm was done, as it was easy to follow the rib back a short distance until the place where the adventitia implicated the subphrenic space was reached. Though several times cases have been lost of liver hydatid operated on abdominally, I have not yet lost one attacked transpleurally, which is due largely to a recognition of the value of selecting a spot where the two pleural surfaces are apposed and will remain so. Operations should never be performed without a screen examination, which shows us definitely the shadow of the cyst.

Transpleural operations are obvious; not so subpleural operations, *i.e.*, access to the diaphragm behind through an intercostal space without opening the pleura. It is doubtful whether we can utilize this route with advantage except occasionally. We know that disease, notably hydatid and carcinoma, passes through the diaphragm into the thoracic cavity by direct extension, by continuity of tissue; infection can pass in either direction in this way, but also by means of the lymphatic system. It is said that the passage is more facilitated by anatomical disposition when the invasion is from above than when it is in the opposite direction. Of course, there is always the difficulty of negativing the carriage of germ infection by the blood-stream. Pneumococcic infection of the peritoneum does not appear generally in the vicinity of the diaphragm, and the sudden appearance of infection in the pleuræ or pericardium in a person abdominally inflamed can be better explained in many cases by blood distribution than by direct lymphatic infection. Great pressure in the space must interfere with the lymphatic return, and serous effusion in the pleura is a common accompaniment of live hydatid of a large size on the upper surface of the liver. It is to be remembered that pleural effusion is much more likely to be a concomitant of hydatid on the upper surface of the liver than of hydatid of the lung. Inflammatory fluid in the pleura may be due to abscess beneath the diaphragm, so that we have a layer of clear fluid or of pus. In a similar manner great pressure may cause varicosity of the veins of the diaphragm, which empty mainly into the musculophrenic in this situation.

A very bad quarter of an hour was experienced by me once during a transpleural operation for hydatid on the upper surface of the liver in a person who showed large subcutaneous veins. After the removal of a portion of the eighth rib, I plunged a knife in the space left through into the cyst. Alarming venous hæmorrhage occurred, which a finger in the adventitial cavity was able to control. It was extremely difficult to stay in any other manner, even temporarily. A large tampon of gauze in the cavity, stuffed with the pledgets and pulled into the wound, eventually stopped it, but further bleeding took place a week later on removal of this tampon, and had to be arrested in the same way. Eventually a good recovery was made. I take it that the diaphragmatic veins were varicose from the same reason as the subcutaneous ones, and I had partially divided a dilated vein.

In X-ray examinations the patient should be viewed face to the tube, and back to the tube to see in which position the hydatid is nearest to the screen. Puncture with a trocar before operation is inadmissible. When a portion of one rib is removed—and one rib, as a rule, is enough—then the exploring trocar can be used with advantage. A small one is best, and the objects of its use are, firstly, to confirm the suspected existence of the hydatid, and then to determine the distance between the diaphragm and the cyst. This can generally be gauged with fair accuracy. If the adventitia abuts right on to the subphrenic space there will be no liver tissue to pass through, so that a knife can be plunged through two layers of pleura, the subserous tissue, the diaphragm, and two layers of peritoneum, into the cavity of the adventitia. At once the left forefinger should enter and pull up the adventitia into the wound. Four stitches are now put through these various tissues (which are now for the surgeon one single layer), so that looking into the wound we see right into the adventitial cavity. This method seems somewhat wanting in care, but as a matter of fact it is much less risky than more careful manœuvres, viz., sewing the surfaces of pleura together, cutting through the layers singly, opening the adventitia by large trocar, and so on. We want to avoid soiling of the pleura and peritoneum by hydatid fluid, and this quick way is the best manœuvre. If there be a layer of liver tissue over the cyst then we must proceed more circumspectly, and, boring through the hepatic tissue with the fingers along the track of the trocar is the best way of dividing it. This can seldom be needed, as by the time the cyst is discovered in the vast majority of cases it will have incorporated the serous membrane with its adventitia. The patient should be lightly anæsthetized so as not to nullify abdominal pressure, which can be increased by the hand of the assistant pressing on the integuments below the costal margin.

There is no need to alter the technique for suppurating hydatids; they need for their treatment the bolder method more than uninfected ones. I have the greater respect for infected cysts near the posterior aspect of the vena cava, of a size that does not cause them to be accessible. They are a very deadly form indeed. They tend to burst into the vena cava, and give rise to fatal hydatid embolism, or hæmorrhage. Even the uninfected cysts may take this desperate course. Therefore the surgeon, if he can diagnose such cysts, wishes to reach and remove them, if he can diagnose them by the pain they cause when infected, by the septic condition of the patient, by some increase of heavy dulness in the liver area behind, by possible help from the screen, and by the presence of an eosinophilia. Fortunately, in addition

to the chance of a burst taking place into the vena cava, there is also a tendency greater than the more fatal one of an infection of the right pleura ensuing. When this occurs the surgeon's chances of bringing the case to a successful termination are much increased. He opens the empyema by a large opening, and endeavours to find the track by which infection has reached the pleura; if he can follow this it must lead him into the adventitia. I venture to deprecate the use of the knife in this position; the trocar may be employed when the empyema is opened, but to use the knife in the liver anywhere near the vena cava is to court disaster. In these very difficult, though fortunately rare cases, waiting and watching for an empyema to form is probably the best treatment, although a tragedy may occur on the side of the vena cava. An unusual form of hydatid, viz., the sub-pleural cyst, would give rise to great difficulty in diagnosis if it were present in the lower part of the posterior mediastinum. The fluorescent screen again would be of the greatest assistance. As a rule, subserous pleural cysts are found higher up, about the level of the scapula, when, of course, they would be outside our discussion.

A very trying form of disease, which may implicate the subphrenic space and its surroundings, may be found in the sequelæ of typhoid infection of the ribs. I have seen a case of this disease where the parts that I have just described as being stitched together in hydatid disease, minus, of course, the adventitia, were thickened to a great degree, and welded into one tissue more than 1 in. thick. These cases are incurable as far as I know.

Of actinomycosis in this region I have seen but one case, and that in the *post-mortem* room. I remember thinking that it also was beyond the reach of surgery.

Pyogenic infections of the subphrenic space are difficult, both in diagnosis and treatment. This is mainly due to, first, the great size of the space; second, the number of organs from which infection may originate. The resulting abscess will be small at first in most cases, and the history, even after the abscess has been present some time, will be the history of the cause, *e.g.*, gastric ulcer, or appendicitis in the majority of cases, but there are exceptions. For example, the abscess may remain often small; the cause of the abscess may have no antecedent symptoms, or may be far away in the body, and a connection between the two is not at first obvious. Sometimes the subphrenic abscess may be successfully treated and the cause remain unknown.

The classical limits of abscess in this space have of late years been enlarged, and abscesses, both under the liver and those which have reached the surface on top, are called sub-diaphragmatic. Then, again, modern surgery, by early operation, has inhibited many causes from acting, and if the subphrenic space should have been infected the resulting abscess is sought for earlier and treated before all its classical signs and symptoms are present. Following Nature we can classify abscesses on the upper surface of the liver by the bisecting lines of the coronary and falciform ligaments. This gives four unequal compartments, and where the crossing of the ligaments takes place a large non-peritoneal space occurs. Abscesses, large and small, may occur in any of these positions, and they may be continuous with abscesses on the under surface of the liver or in the flanks. Certain anatomical facts help us to understand the symptoms and signs of a more or less fully formed abscess in any of these compartments. Thus the coronary ligament is set very far back, and pus in the back part of the right anterior intraperitoneal compartment will be reflected in symptoms at the back rather than the front, and it is easily confounded with a patch of pulmonary consolidation at the base of the right lung. The liver narrows so rapidly towards the left that a perigastric abscess from carcinomatous ulcer is bounded by diaphragm above and stomach below, the liver entering but slightly into the combination.

The portion of liver uncovered by peritoneum is considerable, and an abscess in this areolar space can acquire both size and tension, so that it is more strictly above the liver than the others, and able to force the liver downwards, which the other subphrenic abscesses cannot do, they being forced down by the liver. It tends eventually to develop along the round ligament towards the umbilicus, at which it may point. It is rare, and should be opened high up in the costal angle, near the xiphoid cartilage. The right posterior position for abscess, that is behind the coronary and the right lateral ligaments, is difficult indeed to diagnose. It arises both from appendicitis and gall-bladder conditions. I induced one in a cholecystectomy last year. Getting hæmorrhage in a very septic case I had to plug with gauze far in under the liver; this eventually produced an abscess which, associated with the pre-existing sepsis, caused the patient's death ten days after the operation. This abscess was discovered *post mortem*.

The right anterior intraperitoneal form of abscess varies much in size and position. It may arise from a number of pathological conditions which cause invasion of its integrity by simple direct extension, but it may be caused, I believe, through infection carried by the portal system; thus the case of a man, aged 38, with very bad ulcerated hæmorrhoids, who developed an abscess between the liver and the diaphragm, for which no other cause could be assigned, seems to bear out my contention. An anterior incision along the costal margin led to an excellent recovery. Infection through the portal vein may manifest itself through the gall-bladder, the substance of the liver, or the hepatic surface, and all these without pyophlebitis. Abscess formations in this compartment following appendicitis are the commonest form, and give the surgeon much anxious mental exercise. We do not even think of it so long as the patient is doing well; but if he pauses in recovery, if his temperature chart assumes a septic character, and especially if his tongue remains furred, we become anxious about the subphrenic space. A fully developed abscess will have a tender margin, though the mass of the abscess may cause neither pain nor tenderness (X-rays will help but slightly in the smaller

case). However, tenderness should be sought for in every suspicious case, especially in the intercostal spaces and behind. Percussion may give a heavy feeling of increased resistance to the finger, and be valuable, but we are driven to consider the exploring trocar whether we like it or not. It is admissible before the actual operation, though there must be danger to the pleura in every case. It is, of course, inadmissible below the costal margin. If the patient is very ill he will very probably die if you cannot arrive at the proper diagnosis; the surgeon is justified in taking some risk, and if he uses a very moderate-sized trocar or needle, and keeps as much as he can to the confines of the pleura, where the layers are in contact, the risk is small. A large trocar may lead to terrible results from leakage into the pleura. It is certainly wise to be ready to go on with the operation if pus be found, and then, of course, the cannula had better be left in position. If the danger of sudden flooding of the pleura be avoided by using a trocar of small bore, we should be wrong to neglect the surest means of diagnosing pus, viz., the use of the trocar. We certainly do not wish to enter the liver with the instrument if we can help it, so it is used warily and tentatively. Of course, if the patient's strength is holding out well, it may be wisest to wait in the hopes of the abscess showing below the costal margin, or by fulness of the intercostal spaces. Barnard draws a firm distinction between abscess in this compartment of the space due to appendical inflammation and that of gastric or duodenal origin. In the former the edge of the liver is apt to adhere to the diaphragm along the costal margin, thus preventing the abscess coming into the open. In the latter the abscess does come below the costal margin, and is restrained by the round ligament of the liver to the left and the colon and omentum below. Either of these abscesses may be continuous with collections of pus situated beneath the liver. A variety of incisions can be used in these cases. Immediately below the tenth right costal cartilage is, in my opinion, an excellent one in some cases. This incision gives good access to the undersurface of the liver, even to the portal fissure. When the abscess is fully developed, and consequent on gastric or duodenal perforation, an anterior incision in the site of the greatest swelling is to be chosen. In other cases the transpleural route is a necessity. Two incisions may in some cases be advisable, and the presence of an assistant with unsoiled gloves and instruments is necessary. One incision would be anterior and the other behind, and the utility appears to be obvious. To me, however, a counter opening in such cases is a mistake as a rule. It produces a fresh raw surface in a person already absorbing much toxic material, and it interferes with the action of the intra-abdominal pressure, which is so strong an ally of the surgeon. A moderate-sized incision into the abscess, the introduction of drain tube to a moderate depth, and as little pulling about of the parts as possible seem to be the requisites of surgical intervention.

In the left anterior intraperitoneal compartment we may find abscesses of varying size. I have seen three small abscesses in this compartment which could rightly be termed perigastric abscesses. Around them existed an efficient rampart of inflammatory material. Two were opened by myself, and simply drained with recovery, no attempt being made to solve the pathology. The third, or rather bigger one, I saw with a colleague, who made an effort to ascertain the cause, with the result that a fatal general peritonitis followed. A good leucocytosis was present in each of these cases. A count on successive days must be of the greatest help in cases where infection of the subphrenic spaces is suspected, although the result is discounted to some extent by the antecedent inflammation and by operation.

Perigastric abscesses, which do not come forward, but which tend to fill the vault of the diaphragm on the left side, are very generally found in connection with carcinoma near the cardia, and with mural cancer under cover of the left cartilages and ribs. If they are suspected by the pressure of inflammatory signs and symptoms, a review of the case is very necessary before operation is decided on, because of this frequent association with carcinoma. The same association of carcinoma and abscess is often seen in the intestine, abscess being not infrequently the first sign that calls attention to the underlying tumour. In the subphrenic variety we should stay our hand from operation if the history of the case suggest carcinoma. With intestinal cases it is different, and I have had the good fortune to open the abscess and eventually to excise successfully the carcinoma of the small intestine in connection with it.

Abscess in the lesser cavity of the peritoneum occurs very occasionally, and cannot or should not be diagnosed at operation. Marsupialization, with drainage, is the treatment of all collections of fluid which come forward either between the stomach and liver or between the stomach and colon; and the surgeon can surmise at his leisure whether the pus was in the lesser bag of the peritoneum, or a pseudo-pancreatic cyst, or a pancreatic abscess, or a pancreatic cyst which has suppurated. He is well content to save his patient without gaining exact knowledge of the anatomy of the abscess.

TRICHINOSIS, WITH A REPORT OF FIFTEEN CASES.*

By MONTGOMERY H. SICARD, M.D.

IN man the infection comes from the hog, which in turn has eaten infected offal, trichina-bearing rats, mice, or trichina-bearing meat. The source of contamination is the encapsulated larva, which exists in the muscles of the animal. The infection arises if ham, bologna, pork, sausage, &c., are eaten either uncooked or cooked insufficiently to destroy the larvæ. About 6 per cent. of pork is infected. Boiling ham for three hours did not destroy the larvæ in the centre of it. H. Williams, of Buffalo, found trichina in 5·1 per cent. of 505 indiscriminate examinations.

* From the *Medical Record*, August 15, 1914.

Notes and News.

INFANT DEATH-RATE IN BURMA.

IN Burma during the year 1913, 316,654 children were born and 107,967 under 5 years of age died.

In view of this alarmingly high infant mortality a memorial bearing the signature of a large number of European and Burmese ladies has been forwarded to the Lieutenant-Governor, praying that (1) The cadre of the Government Medical Department be amended by opening twenty-one of the appointments of assistant surgeons (twenty-five being vacant on April 1) to lady doctors: such women of this province as are already qualified and suitable it is suggested should be employed in some of the twenty-one towns now without female medical aid, the remaining vacancies to be filled in the same way as speedily as possible; (2) separate wards for maternity cases be provided in all Government hospitals where such wards do not now exist; and (3) all town authorities in large towns be urged to entertain visiting midwives.

NEW REGULATIONS FOR FEDERAL MEAT INSPECTION IN AMERICA.

THE new meat inspection regulations governing the slaughtering of cattle, sheep, swine and goats, and the preparation of meat food products in inspected establishments, were signed by the Secretary of Agriculture on July 15, 1914. All the regulations become effective on November 1, 1914, except those governing imported meats, which go into effect January 1, 1915.

Packers can sterilize and cook thoroughly certain classes of meat and sell it in cans or sealed containers, labelled plainly "Second Class Sterilized." This sterilized cooked meat is the meat of portions of animals the fat of which the old regulations permitted the packers to make into edible lard and tallow. The process of rendering served to sterilize the fat and make it entirely hygienic. The new plan extends the same principle so as to utilize the lean portions of this meat, which heretofore packers have not been allowed to sell for food purposes.

This action follows scientific investigations made by specialists of the department, and by independent veterinarians and physiologists, which have made it clear that large quantities of meat which are perfectly good food when thoroughly cooked have been condemned because of the presence of strictly localized cysts or lesions in animals. This meat is of the type which the German and Austrian governments have long permitted their packers to sterilize by cooking and sell at shops in a cooked condition. This meat which, cooked, finds ready sale at a lower price than raw meat in Germany and Austria, consists of portions of the flesh of animals which have localized cysts or lesions which make the immediately affected muscle or tissue unsuitable for food, but which do not affect the remaining flesh of the animal or render it unhealthful. Portions (usually organs or glands) containing cysts or lesions are cut away and condemned. These cysts and lesions do not come from any of the highly dangerous diseases, for any indications of which the regulations require the condemnation of the whole carcase.

Under both the old and the new regulations, in cases where the diseased condition is trivial and strictly localized, the unaffected portions of the carcase, which are free from any suspicion of disease, are passed for food and allowed to be sold in the raw state. On the other hand, all carcases and all parts diseased to an extent rendering them unfit for food are condemned. Between these two classes lies the class of meat which may be sterilized under the new regulations. This consists of parts of carcases believed to be entirely healthful, but which comes from carcases affected to a somewhat greater extent than would allow the passing of these parts for food in the raw state, because these parts may contain a chance cyst which, if eaten raw, might lead to tapeworm or other diseases. These accidental cysts or lesions, even if present, are rendered entirely harmless by thorough sterilization in cooking.

While the packers of Germany and Austria for many years have widely availed themselves of this method of saving, by cooking, a huge waste of meat, it is not known how far the American packers will care to follow the practice. It is believed, however, that if it is undertaken it will make available a large quantity of cooked meat which is now wasted.

The provisions relating to the *post-mortem* inspection of carcases have been made clearer and more explicit so as to make the rules under which the inspectors pass or condemn carcases or portions of them exact and in accordance with the latest scientific knowledge. The regulations governing the carcases of hogs suspected of hog cholera have been made much more stringent.

The rules and regulations governing the disposal of condemned meat and the use and integrity of the Federal marks have been redrafted to meet fully all conditions which have developed during the past six years. As a result, it is made certain that the mark "U.S. Inspected and Passed" can appear only on meat that has passed a rigid *ante-mortem* and *post-mortem* inspection at the hands of skilled veterinarians.

On account of the danger from trichinæ in pork and the lack of any known method of inspection which affords an absolute safeguard, the regulations prescribe that no muscle tissue of pork shall be allowed as an ingredient of any article such as summer sausage, or similar foods which customarily are eaten without cooking. To be included in articles which may be eaten without home cooking, the pork must have been subjected to a temperature sufficient to destroy all live trichinæ, or subjected to some other approved treatment which may hereafter be discovered.

The regulations governing the sanitary condition of packing establishments, the cleanliness of employees, and the care of utensils and instruments have been redrafted into a series of definite rules. This, it is

believed, makes compliance with the rules easier on the part of the packers and makes detection of violations simpler for the inspectors. These rules are very explicit as to the provision of washing and toilet facilities for the help, as to the condition of clothing, and as to the cleanliness of the hands of those handling the meat. The rules also explicitly prohibit the passing of meat which has been allowed to touch floors or become contaminated by contact with condemned meat or knives used in butchering diseased meat.

Review.

THE WHOLE ART OF BANDAGING. By Thekla Bowser, Fellow of the Institute of Journalists. With an introduction by James Cantlie, M.A., M.B., F.R.C.S. Profusely illustrated. Pp. xii + 108. Price 1s. John Bale, Sons and Danielsson, Ltd., London, W.

This manual makes a welcome appearance at the present moment, when the care of the sick and wounded is uppermost in our minds. The author knows her subject well and has given much time and energy to the work of the St. John's Ambulance Brigade.

The main object of the book is an endeavour to clearly set forth all that is necessary in the application of the triangular and roller bandages. The instructions are given very carefully and simply, the numerous illustrations helping considerably in driving home the important points.

The book is of such small compass that it can easily be carried in the pocket, and its modest price places it within the reach of everyone interested in bandaging.

GUNSHOT INJURIES: HOW THEY ARE INFLICTED, THEIR COMPLICATIONS AND TREATMENT. By Colonel Louis A. Lagarde, United States Army Medical Corps (retired). London: John Bale, Sons and Danielsson, Ltd., 1914. Pp. 398, Price 18s. net.

The author, the Professor of Military Surgery in the United States Army Medical School, describes the experience of surgeons in the Spanish-American, Boer, Russo-Japanese, and Balkan Wars.

The first five chapters treat of the characteristic lesions, symptoms and treatment; as to shell wounds, poisoning from gases given off by bursting shells is carefully considered. With regard to treatment emphasis is laid on antiseptics as opposed to aseptics.

Seven chapters are devoted to regional lesions of the head, spine, chest, abdomen, blood vessels, joints, and lesions of the long bones.

The writing is clear and precise, the printing and illustratisns are of a high order, the index excellent. The book can be highly recommended both for careful study as well as for ready reference in cases of emergency.

DIETETICS: OR, FOOD IN HEALTH AND DISEASE. By William Tibbles, LL.D., M.D.Chicago; L.R.C.P.Edin.; M.R.C.S.Eng.; L.S.A.Lond. Demy 8vo. Pp. x + 627. Baillière, Tindall and Cox, 8, Henrietta Street, Covent Garden, W.C. Price 12s. 6d. net.

This volume, dealing with food in health and disease, applies the theory and principles of dietetics to the many conditions and circumstances of life. The author, who has devoted years to the study of this question, considers that the present work, and a previous one on "Foods: their Origin, Composition and Manufacture," form a complete system of dietetics.

Part I deals mainly with food values, the composition, digestion and absorption of foods, metabolism, &c. Careful tables are compiled setting forth the amount of food requisite under many circumstances; the feeding of infants, children and adults, a special chapter being devoted to the appropriate diet of old age. Stimulants (such as alcohol) of all kinds, tea, coffee, cocoa, are described in great detail, their effect, good or otherwise, upon metabolism being clearly set forth.

Part II considers the various affections to which flesh is heir, such as diseases of the stomach, intestines, liver, &c.; gout and rheumatism, obesity, diabetes; diseases of the pancreas, suprarenal, thyroid and other glands; of the skin, blood, circulatory and respiratory organs, &c. The nervous system is also dealt with as well as fevers, and in all these instances the appropriate diet is given.

A chapter is devoted to vitamines and the deficiency diseases. It has long been known that various substances in food have a favourable influence on the well-being of the organism, their absence tending to the opposite condition. Amongst these are the substances known as vitamines. It is a recognized fact that when fed on some kinds of food animals grow quicker, larger, and become heavier; whereas with a monotonous diet—such as rice, maize, white bread, pickled meat and canned foods—people suffer and certain diseases are developed. These diseases are due to the absence of vitamines, and are cured by the administration of substances which contain them. The subject has been gone into very thoroughly, the forms of diet to be taken and avoided both in sickness and in health being well defined. The index gives a very good idea of the extent and variety of the subjects discussed. The author is to be congratulated on the skill with which he has accomplished his laborious task.

THE NEWER PHYSIOLOGY IN SURGICAL AND GENERAL PRACTICE. By A. Rendle Short, M.D., B. Sc.Lond., F.R.C.S.Eng. Third Edition, revised and enlarged. Pp. xi + 256. Bristol: John Wright and Sons, Ltd. 1914. 5s. net.

The fact that there have been three editions and one reprint in three years indicates that the scope of the work supplies a distinct need. Practitioners obtain a fellow-practitioner's view of recent physiological investigations. Still more valuable, it gives

students of physiology an outline of the facts which appear most important to a practitioner and examiner. To a careful student it is a key to examinations.

Drugs and Appliances.

Lactic Acid, in the treatment of erosions of the cervix uteri, cervical or vaginal leucorrhœa, or any form of vaginal catarrh due to non-specific ailments, has been proved of real value. Parke, Davis and Co., have prepared a lactic acid bacteria suppository which is convenient, readily soluble, and does not stain the garments; one suppository introduced at bedtime, at first nightly, and then every second night, is sufficient. It is believed that the good lactic acid does in these circumstances is due to the rapid growth of the lactic acid bacteria accompanied by the production of lactic acid and other mild organic acids in a nascent condition. It is suggested also that the putrefactive bacteria flora is changed to one of a fermentative type.

Correspondence.

INTRAMUSCULAR INJECTION OF QUININE.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIR,—It appears to me that the facts cited by Captain H. J. McGrigor may be interpreted in a different manner to that adopted by him. In your Journal of November 2 he mentions a case of malaria who had not taken any quinine because he said it was poison to him, and who suffered greatly after a dose of 10 gr. of the bihydrochloride. Then Captain McGrigor gave him hypodermics of the same salt three times a day for two days, and then one injection daily for a week. No poisoning took place from these injections, and the patient recovered and so appreciated the value of the hypodermic injections that he injected himself twice a week thereafter as a prophylactic. He had no further attacks of malaria (Captain McGrigor does not say for how long.)

It appears to me that this case simply confirms the view that intramuscular injections are little absorbed. If they had been absorbed, the patient should have been as much "distressed" from the use of them as from the use of the *per oram* doses. There is no proof that the injections cured this case, because, as we all know, such chronic cases of malaria are apt to improve for long periods without any treatment at all; and also, quite possibly, the previous dose of 10 gr. which had affected him so much might have destroyed vast numbers of his parasites before the intramuscular injections were commenced.

May I again point out that improvement after a few such injections in a few cases is no proof that the injections are really beneficial. Proof of this can only be obtained after a most searching investigation of a large number of cases treated with and without quinine injections. But in the meantime we know from numerous investigations that injections are likely to remain unabsorbed and to cause considerable local trouble. As quinine is generally absorbed readily by the mouth, there seems to be therefore absolutely no *a priori* argument in favour of the injections, and one really wonders why they are given.

Since writing my letter on this subject published in your issue of September 15 last, p. 286, I have had another case of a patient who suffered from the injections for a month after they were given, and came to me because he was also suffering from the continuance of his malaria! In fact, I suspect that most cases who are considered to have been cured by injections really relapse a few weeks later; and even believe that many of the fatal results recorded of pernicious malaria are due to the use of the injections —because the quinine so given probably remains unabsorbed in the tissues just when it is most needed.

Yours faithfully,
RONALD ROSS.

18, Cavendish Square,
London, W.
November 10, 1914.

Personal Notes.

INDIA OFFICE.

From August 19 to October 27, 1914.

Arrivals Reported in London.—Dr. P. P. Phillips; Dr. D. B. Spooner; Major J. Masson, I.M.S.; Major J. J. Robb, I.M.S.; Captain S. T. Crump, I.M.S.; Captain E. P. Armstrong, I.M.S.; Major W. G. Richards, I.M.S.

Extensions of Leave.—Major W. H. Cox, I.M.S., 3 m., M.C.; Lieutenant-Colonel H. B. Melville, I.M.S., 4 m., M.C.; Major H. R. Nutt, I.M.S., 3 m., M.C.; Lieutenant-Colonel J. H. Macdonald, I.M.S., 1 d., M.C.

Permitted to Return.—Major L. T. R. Hutchinson, I.M.S.; Dr. G. R. T. Ross; Lieutenant-Colonel H. E. Drake-Brockman, I.M.S.; Major E. J. O'Meara, I.M.S.; Lieutenant-Colonel S. E. Prall, I.M.S.; Lieutenant-Colonel J. H. McDonald, I.M.S.; Captain A. A. M. Neight, I.M.S.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment or Department, and the Period for which the Leave was granted.

Armstrong, Captain E. P., I.M.S.
Barber, Captain C. H., I.M.S., to December 3, 1914.
Mackenzie, Major H. M., I.M.S., to October 31, 1914.
Riddell, Captain W. H., I.M.S.
Robb, Major J. T., I.M.S.
Wilson, Lieutenant J. D., I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Harrison, Major C. B., I.M.S., Ms. 6 m., June 7, 1914.
Hunter, Captain J. B. D., I.M.S., 19 m., January 14, 1913.
Masson, Major J., I.M.S., Bihar and Orissa, 15 m., August 13, 1914.
Matson, Captain H. S., I.M.S., Burma.
Melville, Lieutenant-Colonel H. B., I.M.S., Delhi, 7 m. April 1, 1914.
Miller, Major A., I.M.S., M.S.
Robb, Major J. J., I.M.S., Ms. Jails Dept.

Original Communications.

THE SO-CALLED *PLASMODIUM TENUE* (STEPHENS).

By ANDREW BALFOUR, C.M.G., M.D.
Director-in-Chief,

and C. M. WENYON, M.B., B.S., B.Sc.
Director of Research in the Tropics, The Wellcome Bureau of Scientific Research.

IN a comparatively recent number of the *Annals of Tropical Medicine and Parasitology*, Dr. J. W. W. Stephens describes what he believes to be a new malaria parasite of man. After a careful study of his paper we must confess that we are somewhat surprised that so distinguished an authority on tropical medicine as Dr. Stephens should have committed himself to such a diagnosis in the absence of clinical data, and on what we cannot help thinking to be insufficient evidence. His conclusion is wholly based on the morphological peculiarities of a malaria parasite which he found in a single blood film from a native child in India sent him by Major Kendrick, I.M.S. After carefully describing the plasmodium, he proceeds to mention the features which distinguish it from the malignant tertian parasite and the benign tertian parasite. We agree with Dr. Stephens that his parasite is distinct from the latter, and recognize the validity of his remarks on the differences between them.

We cannot, however, join issue with him in the arguments he advances to prove that his parasite is distinct from the malignant tertian parasite, and we certainly think that further proof is required before one can say that this Indian parasite is the type of a new species (*Plasmodium tenue*).

Dr. Stephens believes that *P. tenue* differs from *P. falciparum* in (1) its amœboid activity, (2) the abundance and irregularity of its nuclear matter. Further, he states that his parasite was unlike any malignant tertian parasite that he had ever seen or could find figured in the text-books or journals.

We would point out that Plate VII of the Third Report of the Wellcome Tropical Research Laboratories (1908), here reproduced as Plate I, represents a form of malarial parasite very closely resembling, if not identical with, the so-called *P. tenue*. One of us (A. B.) noticed the peculiarity of this parasite and thought it worth while having it carefully illustrated in colour. The note regarding it will be found on p. 110 of the first Review Supplement of the above-mentioned laboratories (1908), and is as follows: "In the blood of a case which had become infected at Taufikia, on the White Nile, I found the curious amœboid forms shown in Plate VII, Third Report. A parasite closely resembling a trypanosome will be observed. It differs from the hæmogregarine forms described by Billet and, as it was the first parasite found in the film, proved, for the moment, puzzling, although clinically the case was one of malaria. On the following day a few crescents were found. Quinine soon caused the disappearance of the endoglobular forms."

Although morphologically the parasite appeared peculiar there was nothing in the clinical history of the case to distinguish it from one of ordinary tropical malaria, and it will be noted that crescent-shaped gametocytes were discovered. Special attention was paid to the blood film on account of the work of the Sergents, and of Billet in Algeria, a short account of which will be found in the preceding paragraph of the above publication.

It must be admitted that the young forms of the sub-tertian parasite most usually occur as the typical and well known "rings" which are figured in Dr. Stephens's Plate VIII, but it is generally recognized that amœboid forms of this parasite are occasionally found, more especially in the late stages of those cases which have very large infections, and which often terminate fatally. Ziemann, in his article on malaria in Mense's "Handbuch der Tropenkrankheiten," calls attention to such varieties. (First edition, vol. iii, p. 294.) They not infrequently occur shortly before death, but whether their presence implies some diminished resistance on the part of the host, or some increased activity or metabolism on the part of the parasite, cannot be stated. It, however, requires more evidence than that which can be gathered from a single blood film, showing only one stage of the parasite, to create for such amœboid forms a specific name, and thereby to conclude that under no conditions can the sub-tertian parasite depart from its more common morphological characteristics. The simpler forms, such as the parasite of benign tertian and quartan malaria, are characterized, the former by its amœboid activity, and the latter by a want of it. The degree of amœboid activity of the benign tertian, however, varies considerably from one case to another, and similarly one occasionally encounters what are undoubtedly quartan parasites with this feature developed to a high degree. It may be possible to find for these variations some mechanical explanation. Very actively amœboid organisms, unless rapidly fixed or dried, would tend to shrink towards the spherical form more quickly than those which are more sluggish. In this way a parasite which is of irregular form might contract in the slow drying of a film to the spherical shape, so that its amœboid nature would be masked in the stained film. The amount of chromatin in the nucleus is also subject to much variation, and if we assume, as we seem justified in doing, that the amœboid activity is correlated with active metabolism and growth, it is just in such amœboid forms of the malarial parasites that we should expect to find the greatest amount of chromatin. It is only by a careful study of films made on many occasions, and under varying conditions of technique, that we can hope to establish the true nature of such an organism and eliminate abnormal or unusual appearances from the customary cycle of development.

Had Dr. Stephens been able to study his case clinically from day to day and show that the parasite

he describes always assumed the amœboid form at that particular stage in its development, despite varying technique; that in its further growth and multiplication by schizogony it departed from the type usually associated with the parasite of sub-tertian malaria; that the gametocytes presented some peculiar features; then there might have been some ground for thinking that the parasite was a distinct species. Even then it would be doubtful if sufficient justification existed for the creation of a new species on a single case, and the introduction of a new name into the already overburdened literature. An interesting paper by Ed. and Et. Sergent, Beguet and Pantier on abnormal forms of the sub-tertian parasite appeared in the *Bulletin de la Société de Pathologie Exotique* of November 12, 1913. Mention is here made of Billet's and Ziemann's descriptions of curious forms of the quartan parasite, and attention is called to certain elongated young sub-tertian parasites with streaked arrangement of the chromatin. Though these forms are not amœboid to any great extent they are interesting in that they show that the young sub-tertian parasite has been noted to depart from "the regular, almost monotonous, contour of the rings."

In addition to the Sudan case mentioned above, two others which have come under the notice of one of us (C. M. W.) are of interest in this connection. The first was from West Africa, and there is but a single film, as in Dr. Stephens's case. The film exhibits amœboid forms in large numbers, and a reference to Plate II A will show that they are identical in every respect with those figured as *P. tenue* by Dr. Stephens. In addition to the amœboid forms there occur a considerable number of ordinary ring forms and, what is most important, the characteristic gametocytes of sub-tertian malaria (Plate II A, 4th row). It is only reasonable to conclude that this case was one of sub-tertian malaria due to *P. falciparum*, the young parasites of which are particularly amœboid for some reason not clearly understood.

The second case was that of an adult Arab who had contracted malaria in Busra, at the top of the Persian Gulf, and was seen by one of us (C. M. W.) at Bagdad in 1910. He was brought into the laboratory in a dying condition, and only semi-conscious. A blood film at once showed that he had an enormous malarial infection (Plate II B). Several films were made then and an hour later, just before the man died. The parasites in these films were recognized as, being peculiar, and it was at first thought that they might represent a distinct species. However, an examination of the literature relating to sub-tertian malaria showed that similar infections were not uncommon. The striking features, apart from the intensity of the infection, were, firstly, the presence in the blood of large numbers of schizonts in all stages of nuclear multiplication and with great variation in the number of merozoites, and, secondly, the occurrence of numbers of crescents, the developmental stages of which could be readily traced from the younger forms (Plate II B, 4th row). Ordinary rings of the sub-tertian variety were very numerous, and, in addition, there were present irregular amœboid forms like those figured by Dr. Stephens, and which are the prevailing forms in the West African case already cited. Furthermore, both in the Bagdad and the West African case the quantity of chromatin in the nucleus was considerably larger than is usually seen in the sub-tertian parasites. The amœboid forms evidently represent the youngest stages of the parasite, since in them pigment appears to be absent, but that this form of parasite produces pigment is clearly shown by its presence in the gametocytes and schizonts of the Bagdad case.

Another point of considerable importance is that many of the infected corpuscles showed Maurer's dots (Plate II B, end of 3rd and 4th rows). Therefore, in this case, considering the absence of enlargement of the infected red cells, the presence in them of Maurer's dots, the occurrence of gametocytes of the crescent type, schizonts with merozoites varying in number from half-a-dozen to four or five times that number, there is complete agreement with what we know of the parasite of sub-tertian malaria. The presence of amœboid young forms with richly developed chromatin is unusual, but he would be a bold person who would venture to establish a new species on this character alone.

Dr. Stephens has named such an amœboid form seen by him in a single blood film *P. tenue*, but has not produced any evidence to prove that he was not dealing with an amœboid sub-tertian parasite. It is unfortunate that in his film there existed only the single stage—neither schizonts nor crescents being present to help in the diagnosis.

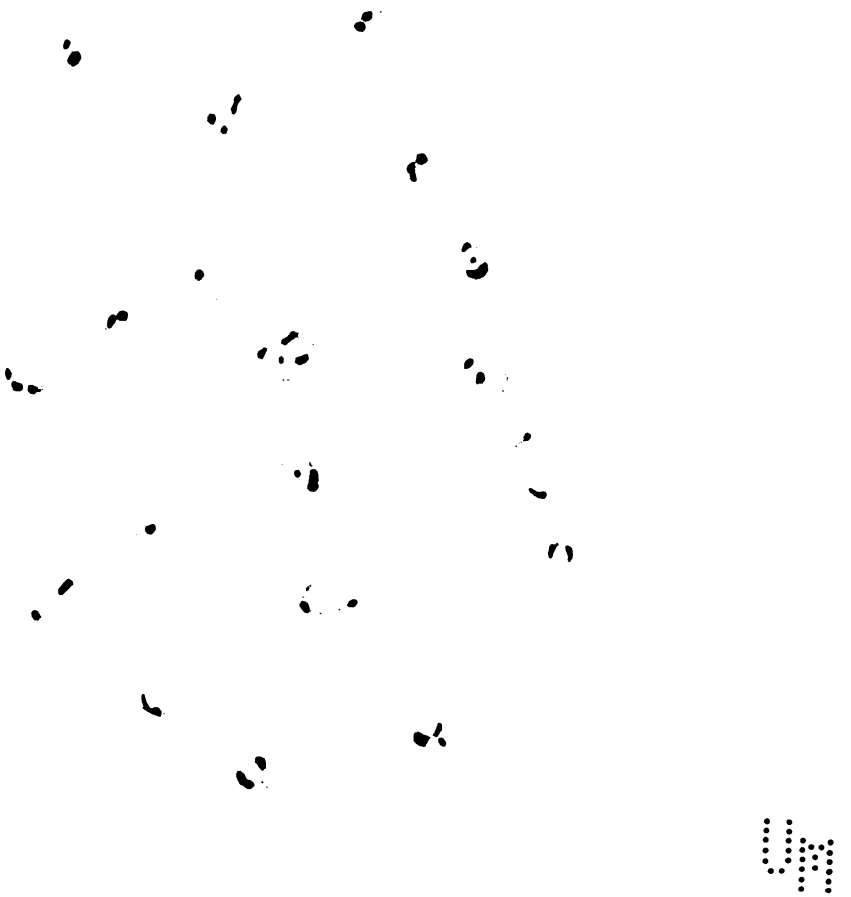
We would express our indebtedness to Messrs. Richard Muir and George Buchanan, of Edinburgh University, for their care and skill in executing the drawings from which the plates illustrating this paper were prepared.

ASIATIC CHOLERA.

By John Furse McMillan, L.R.C.P.Lond., M.R.C.S.Eng., L.S.A.
Late Royal Army Medical Corps.

On all sides it will be granted, and indeed it would be folly otherwise, that the heads of the profession at the various hospitals of the Metropolis, and within the British Isles generally, are in a better position—from perhaps their longer course of study forced upon them in order to obtain the higher qualifications, and so a furthering of their intellect—to specialize, in some branch or another, whence an individualism or personality is produced that without demur causes any opinion from such to be received as the crux for those of more multifarious duties and calling to follow. Yet, nevertheless, from the very fact of their digging deep in a circumscribed area of ground, they may be incognizant of what transpires in a neighbouring area. This, perhaps, may not be new in any way, for both Sir William Ferguson in Surgery and Sir

PLATE I.

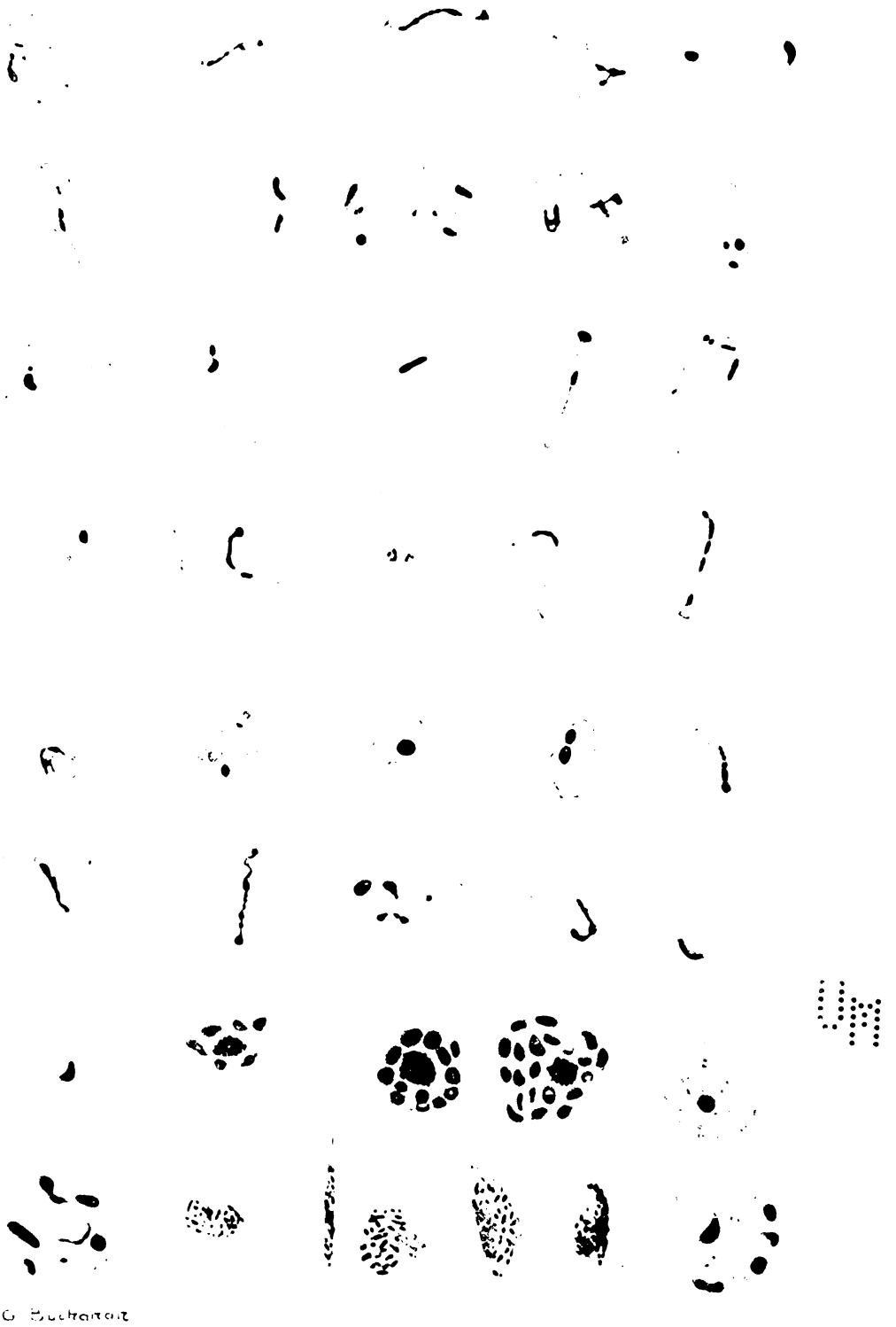


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To illustrate paper, "The so-called *Plasmodium tenue*," by ANDREW BALFOUR, C.M.G., M.D., and C. M. WENYON, M.B., B.S., B.Sc.



PLATE II.



To illustrate paper, "The so-called *Plasmodium tenue*," by ANDREW BALFOUR, C.M.G., M.D., and C. M. WENYON, M.B., B.S., B.Sc.

Thomas Watson in Medicine have left on record that they were in a measure obliged to eschew specialism, the former specifically when the question of excision of joints *versus* amputation of the limb came to the fore, and the question of diagnosis of disease occurred; and the latter generally in his lectures on the principles and practice of physic. But, at the same time, Sir Thomas Watson is so far a specialist that when he comes, or rather should come, to speak of the plague, he dismisses the matter in a word by saying that he has not seen a case. So that for one who has had experience of Asiatic cholera, one must not look within the British Isles, or in fact in Europe or America, but to India, the home of the disease. And there the profession is divided into four classes: the Indian Medical Service, military and civil, the Royal Army Medical Corps, and civilian practitioners; and inasmuch as the former service deals mainly with natives, and the latter is stationary in one place, it stands that an officer of the Royal Army Medical Corps, located now in cantonment, then on the line of march and in camp, in medical charge of European troops, has a far better opportunity of studying Asiatic cholera than others.

The occurrence of Asiatic cholera in Galicia, Hungary, and Austria brings the matter near home, so that one need offer no apology for writing a monograph such as will be a guide to prevention, diagnosis and treatment, as concerns a disease that leaves one little leisure for either when it is actually at hand. It is a well-established fact that a horse turned out to grass returns to work with the greater ardour, and so the author trusts will be his case.

Cholera is endemic to India—hence its name Asiatic—about the low alluvial country bordering on the Ganges. By endemic is meant that there is the home of the disease, and whatever may have been its primary cause in the history of the world, the first recorded epidemic is that which occurred at Athens, known as the Pestilence, and described by Thucydides; and in a measure it is a typical account, although the great Greek historian lived in the fifth century B.C.; and it is well to remember that he suffered from the disease himself. The author has translated the portion of the History, and it reads as follows:—

"In such a way were his[1] funeral rites carried out that winter, and with his decease the first year of the war came to an end. At the very beginning of the first month of summer the Peloponnesians with their allies divided into two parts, and the first as it were led by Archidamus, the son of Zeuchidamus, first overran, then settled down, and ate up the country. And not many days after their presence in Athens the pestilence first made its appearance amongst the Athenians, perhaps it would be better to say broke out on all sides, both around Lemnos and in other countries. Never before does any man remember to have happened such a pestilence and consequent[2] mortality. At the commencement the physicians were unable in their ignorance to find a cure, but themselves died in great number, and so fast as they came forward, nor was other human skill of avail, so that they thronged to the temples in supplication, or sought comfort in their need from philosophies and such like; all without profit; until at last they desisted from them, conquered by the scourge.

"It came, in the first place, it is said, from Ethiopia[3] by Upper Egypt, and thence extended down to Egypt and Libya, and so to the country of the Great King.[4] It suddenly addressed itself to the city of Athens, and in the first place fastened on to the maritime population of the Piræus,[5] so that it was said by them that the Peloponnesians had poisoned the wells, for they were no longer sweet. Next it reached the upper city, and there died many more, rapidly. So it was concerning it that each knew, both physician and layman, what likelihood there was of its happening to him, and considered, whatever the causes were of this evacuation, it to be curable, and he able to withstand it. I will speak of such as occurred, and about what one could see, when and how it seized one, especially how one having a foreboding should not ignore it. Such will I make clear as one who has been smitten, and as one who has seen others suffer. The year in which it happened, as all grant, was markedly free from other sickness, and if there was any it was quite differentiated from this. Without any apparent cause, of a sudden, whilst in good health, suffusion of the eyes, and cramp seize one. The intestines, the throat, and tongue quickly become inflamed, the breath short and ordure is discharged. Thence, as the result, sneezing and hoarseness are produced; then as the disease progresses, this is succeeded by a marked huskiness, and as soon as it settles in the stomach it turns the latter so that its contents are cleansed of bile; such as are treated by the physicians fail to recover, as also those who are not; under the great bodily suffering a fruitless retching occurs in most, abating in some at this stage, in others and the most, continuing longer. And the body of those lasting on was not very hot, nor was it yellow, but reddish, livid, carried to the point of a sore; the inside is parched up, so that altogether the walls of the gut which is like fine cloth is cast off, so that they become empty, whilst pleasantly as cold running water, they empty themselves, and many careless men run to the water tank, oppressed by the never-ending thirst, and it stands to reason that the water is polluted and depreciated for drinking purposes. And the distress of it never keeps away, but lasts throughout. And the body at such time as the malady may reach its climax does not wither away, but holds out against expectation in such misery. So that most are either unconscious about the ninth or seventh day from the fever within, still retaining vitality, or should it escape from the passing of the

[1] Pericles.
[2] Bk. 2. Secs. 47 to 53 and part of 54.

[3] Ethiopia in the fifth century controlled one side of the Red Sea, and was in free communication for purposes of trade with India.
[4] Persia.
[5] Seaport five miles from Athens, with which it was connected by a fortified wall, open to carts.

disease down to the intestines, extensive ulcerations proceed from it, and the contents of the bowels running out like pure water, most sink at last through asthenia due to this. But it may pass through the whole body commencing from above, the head being the primary source of the malady, and if anyone possessed of great bodily strength happen to linger on, then the disease may attack his extremities. For it may fall like a flash on the pudenda, or the extremities of the fingers or feet, and many of those stricken lose these, whilst to others the eyes are lost; again others when convalescent suffer from loss of memory, and fail to recognize themselves, others, or even their attendants. That which we saw of the pestilence beggars all description; it was difficult to deal with and attacked without distinction all of the human race; and beyond dispute it was shown that birds and beasts such as prey upon man, many of whom remained unburied, either did not venture, or tasting perished. The disappearance of these birds proves the dictum, for they did not fly away, nor did they vanish in any other manner; the dogs also gave man to understand what was the matter when they made a meal together. Therefore often, but sometimes not, the disease presents an extraordinary nature, for instance anyone may catch it and give it to another, or at least such was the general belief; and somehow it cast its sorrow in its own way, in obedience to no custom, as to how it might come, or when it might cease. Some died without treatment, others with all medical attendance possible. As concerns it there was no remedy, so to say, that proved of any benefit, for if it works well with this man it injures that. No frame was able to struggle against it, strong or weak, all were swept away, and every diet was tried. The most terrible part of the whole malady was the despondency, so that anyone in the way of sickening brought the disease upon himself (for when they lost hope the mind speedily became unhinged, and they made matters much worse for themselves by not fighting against it); one after another they filled themselves up with medicine,[1] and died like cattle, and it did for most of the debauchees. But still although no one aware of the danger went near others, lonely dwellers perished, and houses were wholly emptied from lack of treatment; for those attending perished, and especially those displaying valour: those affected dirtying themselves went among their friends, and so the relations of those about to die, as they were carried away, were unmanned by their lamentations, and quite subdued by this epidemic. But above all those who escaped death and overrode their trouble, knew by experience what the disorder was, and were in good heart, for the same person did not suffer from the disease twice; just as if it were killed, and they felt themselves blest above all others, and amidst this present joy nourished a light hope for the future, that they should never afterwards be attacked by any disease. The conveyance of provisions from the country to the city brought many in contact with the pestilence when it fell, and the latter did not spare the newcomers. It did not commence in private houses, but in stifling huts, at its height in the middle of summer, it is judged the murrain obeyed no order. The dead bodies were heaped one upon another, and those stricken lay rolling by the way, and around the wells in their desire for water. The temples in which they camped were full of corpses. The pestilence exceeding all bounds, and numbers dying of it, and men not knowing what to do took to blaspheming things both sacred and profane alike. Order was broken by those whose business it was to keep it, in the first place about the burial places, so each dug as his strength permitted, and many had recourse to very indecent modes of interring; from the scarceness of conveniences what one goes to the thicket for remained about them, and they bungled in placing the accumulations on the artificial fires; some laying a corpse on a fire, which sat up of its own accord; whilst others threw up some of those bearing the corpse and went their way.

"When the pestilence first cropped up somewhere in the city there was no lawlessness. But the disease spreading some were brave enough to conceal the fact, and would not forgo their pleasure, until noticing the sudden change caused by the disease in other pleasure seekers, their speedy deaths, and that they were slain without any warning, immediately mended their ways; yet, nevertheless, some quickly altered and again turned towards pleasure, acting so that their affairs suited the ephemeral nature of their bodies. Indeed to continue any longer in pursuit of the Ideal no one was ready, considering that, as before such a point could be attained death would overtake them, for the present pleasure in all its surroundings to be to their profit; so this stood for both the Ideal and Material. Neither the fear of God nor the laws of man pertained, men judging it to be the fact that, whether they honoured the gods or not, from what they saw around them on all sides their destruction would be equally certain, no one expecting that judgment would be prolonged till judgment should take effect, and he receive the punishment of his offences; nay, they supposed that a far heavier judgment already denounced against them hung over their heads; and before it fell upon them they thought it right to snatch some enjoyment of life.

"Such was the misery that alighting upon the Athenians settled upon them, men dying within the city, whilst the country outside was visited by it, all that is reasonable concerning which in all its details the Elders remember and say that they were satiated with it."[2]

The author has translated the foregoing passage from Thucydides without consulting any other translation, because most of those who have attempted the matter before work on the more or less preconceived lines of a certain word meaning such and such, so

[1] Wine entered extensively into the Greek and Roman Pharmacopœias.

[2] Text and notes (Bloomfields).

that when any attempt has been made to give a closer name to the common one of pestilence, it has been that of the plague, and in more recent times typhus fever. But it should be remembered that a Greek, at all times somewhat involved in his style, would be more so when describing such, to him, a nauseating disease as cholera would be. One can picture a collection of Greeks assembled, say upon the Acropolis, suddenly assailed by most violent vomiting and purging, and the effect it would have on their white clothing, such that to æsthetics, as Thucydides says, gone was the ideal. Hence we conclude that he uses ambiguous language. The author proposes to leave any further elucidation of the question until later, and to now proceed to give a brief history of such epidemics as have been recorded since that by Thucydides.

The authority upon endemic cholera of the last century is Charles Macnamara,[1] who made the disease his study in the ever infected area, and it should be remembered that the investigation of epidemic Asiatic cholera is much more cosmopolitan. Sir Thomas Watson, the author is of opinion, has given the best *résumé* of the cholera epidemics which have reached Europe and America from India, so that we will take his word as concerns them. Macnamara informs us that cholera was known to the ancients, and that what he calls simple cholera was described by Hippocrates; but the first epidemic he records is that of 1817, when cholera, which was prevalent about the Ganges, rapidly spread over the whole of Bengal; extending during the following year over the greater part of Hindustan, and from thence to Ceylon, Burma, and China. The disease was carried from Bombay to the Persian Gulf, and spread over adjacent parts, but did not extend to Europe.

Now the epidemic of 1817 did not extend to Europe for a certain reason, and that is because from Central Asia it worked away east to the north of the Himalayas. But a point we must impress is the manner in which it travelled from Bombay to the Persian Gulf. This, and the word we are going to employ is not newly coined but one used at the time, was effected by means of what is known as a carrier; and it is well to bear this in mind, as the subsequent history of the investigation of the disease in a great measure turns upon this word carrier. From 1817 until 1824 the disease, so far as Europe is concerned, lay dormant, or at least so the English authorities would say, whereas Macnamara states that in 1826 the disease again burst out in Bengal, and then by way of Cabul, advanced into Europe through Russia, and thence to America. Sir Thomas Watson gives a lucid description of the arrival of this the first epidemic in England. From Russia it moved on through Germany to Hamburg, whence a carrier was the means of transferring the disease to Sunderland; it crossed the Atlantic and devastated both continents. It then crossed the Channel to France, where the first points of affection were certain ports on the northern seaboard, whence it was propagated over the whole country.

[1] "Quain's Dictionary of Medicine," 1882.

Much speculation, some almost mythical which would not have disgraced Thucydides, was displayed as to the cause of such very great methodical movement, but all who had cause to treat cases in this country were unanimous in the opinion that the disease was either contagious or infectious, two words that have caused much confusion in the appreciation and elucidation of the cause of disease; some from observation and experience inferring that contagion applied to the so-called zymotic diseases, such as variola and typhus, rather than to cholera, and so they applied the word infectious more peculiarly to the latter disease, and as at the time the distinction between typhus and typhoid had not been clearly worked out, perhaps to Asiatic cholera the word "infectious" in its true sense was first applied. This is interesting and important, and will be found the keynote in the study of all subsequent epidemics until the present day. And in 1831 this drawing of a, at the time, crude, if not nice, distinction between contagion and infection led some of the profession, who were cognizant of the fact that the disease was infectious, not only to assume a bolder attitude themselves, but to induce the laity to appreciate the fact that there was little to be feared from contact.

In 1840 during the China War the disease was carried by native troops or followers from Bengal to China, where it became epidemic, on to Burma, thence to Thibet, and thence by way of Kasghar to Bukhara, Afghanistan and Scindh. In 1845 it passed through Persia to Russia, and traversed Europe, to appear in America in 1848.

And now it is well to remember that the cholera endemic to Bengal might either be dormant, active, or recrudescent. When dormant there was no knowing when it might become active, but once active it did not readily again become dormant, but assumed the form of recrudescence, small epidemics radiating from the endemic area over the rest of Bengal; and this is what occurred from the years 1845 to 1848, so that whilst the disease was raging with violence in America, in 1849, it passed to the Punjab, then to Bombay, whence a carrier conveyed it to Persia; thence it spread northwards to Arabia and Russia, on the one hand, and to Egypt and the south of Europe on the other. Then, on the heels of the previous epidemic, it visited the British Isles, and ended its course in America again, with great violence and virulence. This is known as the epidemic of 1853-54, at or about the time of the Crimean War. During the year 1860 the disease again became active in Bengal and the Central Provinces; it passed to Bombay, and then along the shores of the Red Sea, whence it was carried by pilgrims to Mecca: thence it gradually found its way to Europe and America for the fourth time. This is, as it were, the epidemic of Asiatic cholera of our own time, and there are many stories told of how the inhabitants of densely populated districts of the Metropolis fled in panic into the country, so acting as carriers and furthering the spread of the disease. The author remembers as a small boy being haunked from Hampstead,

whilst the disease was raging in Camden Town, out of the danger zone.

Sir Thomas Watson is of opinion that the epidemic of 1840 was the most violent of any, and places the number of deaths at 70,000. And since the epidemic of 1826 little fresh light was thrown upon the ætiology of the disease; indeed some might say that there was a retrograde movement. Whatever truth there may be, and there is some as will be seen later, it was the general consensus of opinion of the profession that the disease was air-borne and depended upon atmospheric conditions in the epidemics of 1860-62. Sir Thomas Watson, however, stuck to his guns, and always held the view that the disease was "catching," and he agrees with Dr. Body that "when it travels over great distances, as from one country or region to another, it uses the vehicle of human intercourse; but that it may be, and often is, diffused over smaller places, as from one part of a town to another, or from a tainted port to a ship anchored to leeward, by the movements of the atmosphere." And he tells the story how two pilots who obtained a tow by catching hold of a rope astern of a vessel with cholera aboard contracted the disease, and carried it home to their families. He also quotes from the *Times*, October 15 or 16, 1865, how Gibraltar and St. Roque, five miles distant, were smitten by the plague not only on the same day, but at the same moment. It is well in passing to note that Sir Thomas uses the word plague in its broader sense as pestilence, although he well knows, and indeed intends to be meant, Asiatic cholera, so that only slight clerical error would seem necessary for confusion to occur, a point worth remembering as regards Thucydides's description of the Athenian pestilence. And that reminds us that Sir Thomas tells the story, how at Constantinople on the appearance of the disease the seagulls deserted the Bosphorus, and did not return until the cessation of the epidemic. Again, he makes mention of rooks in a rookery near Sligo, within a day, or at least two, of the appearance of cholera there, dying off until the remnant flew away, to return exhausted, and evidently recovering from sickness, when the epidemic died out.[1] This tallies with Thucydides's description, but the King's College lecturer seemingly had not studied him, or he would have noticed the Grecian historian's account of the wells. But it must be said that Sir Thomas draws attention to what is known as the Soho cases, where Dr. Snow proved conclusively that a well contaminated by a sewer leakage was the cause of the appearance of the disease in all the houses in streets supplied by a certain pump. Again, he relates the case of where an artesian well sunk in the centre of an infected area caused the neighbouring streets furnished by the water to stand out like an oasis where the disease prevailed. Perhaps, however, the most striking case of the proof that whether—of course we speak as at the time—the disease be catching, contagious, infectious, air, food or water-borne—nevertheless there can be no question as to the latter cause—is the story credited to Macnamara, where some dozen natives drank in the evening water that had been exposed to the sun, in an open vessel, several of them contracting Asiatic cholera, some dying, and only a few escaping. There was much talk in India at the time of the occurrence, and although possibly desperate straits necessitated desperate means, yet, even were they criminals, the measure was considered a strenuous one.

So much so for the history and general ætiology of Asiatic cholera, until such time as the author, during the course of his service in India, came into contact—in its broadest sense—with the disease itself, and so was enabled to draw deductions, inferences, and conclusions of his own, and that was some few years after Koch had, in 1884, astonished the medical world by his reputed discovery of a bacillus which he, from its resemblance to that point, likened to a comma. But in the interim between the epidemic of 1866 and his discovery, workers in India had not been idle, and it had long been deduced as the result of research and observation that the propagation of the disease beyond the endemic area of the Ganges depended upon a certain materies morbi, materies peccans, that was called the germ of the disease, and origo; the latter being terms culled from Celsus and Paracelsus to denote the origin of disease. So that it was generally acknowledged that the disease depended upon a certain specific poison, which was disseminated by a carrier from the endemic area, and then either by air, food, or water, by infection, was propagated. For a time the school that viewed climate as forming the chief cause of dissemination held the field, but then as it became dogmatic it was overborne by the water infection theorists, who in their turn laughed at the idea of climate and atmosphere playing any part in the propagation of the disease. During the Burmese War the author was stationed in medical charge of a section of a field hospital at Shwebo, in Upper Burma, and one evening, whilst he and a brother officer were returning from a walk outside the stockade, they were asked by an officer of the Indian Medical Service if they would care to see something that possibly they had not seen before. They answered "Yes," when they were ushered into a large bamboo hut—raised on piles—and the sight that met their eyes was such as Thucydides describes at Athens. Some twelve or eighteen sepoys were lying prostrate on their charpoys, or doubled up upon the floor, suffering from a most violent form of Asiatic cholera, the symptoms of which will be described later. And this may seem strange, but it is true nevertheless, the author's brother officer was seized with violent retching, was placed in bed, and during the course of the night suffered from evacuation with slight cramps, but in the course of the ensuing day, being a strong man, of athletic frame, was himself again. Of course it might be said that contagion was the factor, but it is again possible that through the lungs he inhaled dry fæcal matter; or again it may be that the attack was of the nature of those

[1] Fleming ("Animal Plagues") bears out this statement; 33,000 dead rooks were picked up on the shores of a lake, horses were stricken in Russia, and dogs in India.

that are classed as sympathetic, and which are peculiarly allied to hysteria. Perhaps we may pause for a moment to say that, as regards preparation for the meeting of the disease in the British Isles, a study of the workings of small epidemics, such as occur in India, are of more value than possibly is the study of the larger epidemics that have occurred of recent years in Russia and other places; for it is, as it were, that a seaman at some seaport, such as Sunderland, will carry the disease to his home, possibly into a neighbouring village.

Two days after the author's brother medical officer recovered from his ambiguous attack, one morning two European soldiers reported sick, were detained and diagnosed as cholera, and in the course of the day two more reported themselves. Two recovered in a couple of days under treatment, one died, whilst the third made a slow and prolonged recovery from reasons to be described hereafter, due to suppression of urine. The twelve or eighteen natives it was ascertained were from one company; a transport follower had a week before the outbreak joined from the endemic area in the Ganges, where the disease had become active, and had extended to certain neighbouring villages; and now amongst the natives affected was a non-commissioned officer who was on friendly terms with one of the soldiers, whilst the three other soldiers were the latter's immediate chums; and employed by the native non-commissioned officer to do odd jobs was an Indian native, who cleaned the European soldiers' rifles, &c., for them. With the exception of the one British soldier and three natives, in ten days' time there were no signs remaining of a cholera outbreak. It should be remembered, however, that although Indians for the most part profess otherwise, yet on occasion they will drink, and it is possible that preceding the outbreak a carouse had taken place, when shamsu, the Burmese liquor, was imbibed in quantity by both them and the British soldiers.

The author will now describe an epidemic localized in India.

In 1885-86 cholera became active in the endemic area, and suddenly appeared in Cashmere; seemingly a long jump for it to make, but investigation proved that Afghan horse-dealers had returned from the infected area through the Khyber, and cases of cholera occurred in Afghanistan, whence it was carried to Cashmere, where there occurred an epidemic of short but violent duration. And, perhaps, it will be well to give a brief description of the lie of the country about the Murree Hills. The summer resort for the Rawalpindi district in 1885, Murree is situated on a plateau formed by the flattening out of a spur of the Himalayas running down to the river Jhelum, across which is the road into Cashmere, open to dak, the rough pair-pony tonga of the natives, in which, however, Europeans travelled. Between Murree, with the various hill stations situated on the spurs of the Himalayas running down to it, and the river Jhelum was situated what is known as Camp Gharial, where a European regiment was stationed under canvas for the summer. Only one or two Europeans were attacked in Srinagar, but in every dak bungalow, between that city and the Jhelum, here one and there two natives suffered, and perhaps it may not be out of place here to speak of the manner in which the native may be affected. He appears either to suffer to a terrible degree, or only in a slight measure. Once at a Cavalry camp at Akhora, near Lahore, the author was asked by a brother officer in medical charge of a battery of Horse Artillery to see a native follower. On examination there appeared little amiss with the man, and the medical officer in charge, not being over conversant with Hindustani, had a difficulty in understanding what the native was saying, there being no interpreter, as for some reason the apothecary was absent. The author, however, gathered from the natives of the Army Service Corps that the man in question had visited some friends some eight or ten miles off, where cholera was prevalent, and they insisted that the man himself had been attacked on the road whilst returning, so—inasmuch as when a native takes the trouble to make an assertion, and has nothing to gain one way or the other, he may be trusted—there was little doubt that the man was in what will be considered later the reactionary stage of Asiatic cholera, with some slight suppression of urine; isolation, fumigation, disinfection, saved the majority from, perhaps, an infliction whilst the man himself remained under treatment. This case is interesting and instructive as showing how a carrier will wander about disseminating the poison, as long as he himself suffers from no great personal inconvenience.

Then, to return to Camp Gharial, in June, towards the end, a case pronounced to be Asiatic cholera occurred in a native near the dak bungalow by the Jhelum, and in the first week in July, without any premonitory warning, two colour-serjeants of the British regiment were brought to hospital suffering from most violent Asiatic cholera, which raged for six weeks, some fifty cases occurring, of which thirty were of a pronounced type, and some fifteen deaths, amongst which were two women on the strength.

And now the author will give a description of Asiatic cholera.

The soldiers were either suddenly knocked out, experienced premonitory diarrhœa, or, as one soldier described his feelings, felt "gummy-headed," by which he meant that he was suffering from headache and other symptoms of malaise, with some slight symptoms of coryza, looking in a measure as if he were sickening for measles. There might or might not be vomiting. When a soldier was suddenly and violently attacked, he was generally assailed by profuse diarrhœa, with intense abdominal pain, quickly followed by violent cramps, rapidly falling into collapse. Where there was premonitory diarrhœa the same end might be reached, but on the whole the prognosis was more favourable than in those in whom there was premonitory malaise, the latter cases usually and speedily assuming a virulent form; but practically there was no great or marked difference between these two types of cases. As the stage of collapse

was reached the cramps of the limbs subsided and there ensued a most violent thirst and desire for water, following a desire and appreciation of any liquid. Whilst the cramps last the skin assumes a livid hue, gradually turning mottled, and with the reaching of the latter stage the eyes are sunken, whilst the tremulous, feeble, moving hands form the only difference between the cholera-stricken patient and a corpse. The voice, such as it is, is as though a child's squeaking toy has been pricked, respiration may be accelerated, whilst the pulse is thin and wiry. The evacuations have been compared, and aptly, to water in which rice has been boiled, hence the name commonly applied to rice-coloured evacuations. The urine is suppressed. And upon the re-working of the kidneys will depend whether the patient recovers from the algide state, or gradually passes away from syncope and asthenia. Should the tubuli uriniferi commence to fulfil their functions, then is the prognosis hopeful, and what is known as the stage of reaction is reached when the temperature, which throughout both collapse and algide stages has been below the normal, will rise, and initially would appear to depend upon the accelerated functions of digestion, assimilation and nutrition, to the normal, and then will overshoot it. In other words, Nature temporarily loses her inhibitory control over the heat-producing mechanism by the extra work thrown on the vagus nerve, through its communicating branches with the sympathetic. So that there is little untoward to be feared *per se* from a rise of temperature. Should, however, the tubuli uriniferi fail to perform their functions involved in the rise of temperature and consequent fever due to the extra and sudden strain thrown on to them, then will partial or complete suppression, followed by uræmia, coma and death, occur. If, however, there be a rally, then may Bright's disease in one of its forms occur as a sequela. Again, reaction may be partial or become suspended, when as a sequela gangrene may occur. Under normal conditions, however, this seldom happens in Europeans, whose diet is adapted to reaction, but is not uncommon in natives. The author remembers once, when in the line of march in India, being requested by a medical officer of the Indian Medical Service to ride some ten miles out of his course to assist at the operation of the removal of a gangrenous hand from one native and a leg from another, sequelæ to cholera. Chest trouble may occur as a sequela, especially in the aged, from the impairment of the working of the bronchi and air vesicles, during the reaction, and chest trouble such as tubercle may be accentuated. But inasmuch as impaired reaction is rare in Europeans, so are these sequelæ. Bed sores, of course, may arise, be they not guarded against.

As to the treatment there has been much divergence of opinion.

The author, as the result of the study he made of the Camp Gharial epidemic, came to the following conclusions, remembering that Koch's comma bacillus was then rather speculative than proved. The disease was due to a materies peccans that was not indigenous to the body, but in some manner passed into the mouth and so found its way into the intestines, either through air, food, or water, but that in most if not all cases there was the predisposing cause of premonitory disturbance of the digestion, accompanied by diarrhœa or otherwise. The two colour-serjeants, the evening before they were attacked, had together eaten a cured pig's cheek that had been presented to them, and which came from a native porkery; whilst engaged in this repast one remarked to the other that the face did not seem quite up to the mark, to which the other agreed, but as it was a present he replied he was going through with it. This they both did, with the result that they were admitted to hospital the next morning and died of Asiatic cholera in the night; and inasmuch as two soldiers suffering from excessive beer drinking were also admitted to hospital and died within twenty-four hours, gastric disturbance and diarrhœa, or what is known as ptomaine poisoning, cannot have been the cause, but it would appear clear that finding a suitable nidus to develop in the materies peccans throve and developed in the intestines.

And now before coming to the treatment it would be well to discuss the pathology, as the former depends in a measure upon the latter.

In the *Lancet* of September 19 and the subsequent issue, appeared the Lettsomian lectures delivered by Dr. Sandwith concerning dysentery, wherein he draws with niceness a distinction between the two divisions of the disease, one called amœbic dysentery, the other bacillic; the former tropical and dependent upon the presence of the *Amœba histolytica* in the system, less in the blood than in the mucous membrane of the intestines; and the latter, bacillary dysentery, due to the presence in the intestines of a fibrillated bacillus. Both these forms of the same disease were known in the nineties, but there was confusion between the two; however, at the same time it is well to remember that a chronic form of dysentery was recognized as a form of tropical dysentery, the acute form readily amenable to ipecacuanha and the chronic to ipecacuanha and quinine. And the author remembers an occasion whilst in medical charge of a train load of invalids from Upper India to Deolali being held up outside Delhi by three cases of cholera occurring in men suffering from what was then called chronic dysentery, a form of the disease that was seldom if ever met without malaria as either a predecessor or concomitant. Dr. Sandwith has been so good as to inform the author that "ipecacuanha destroys the *Amœba histolytica* not only in the body but in the test-tube," so that so far as the matter in hand as regards Asiatic cholera is concerned, we will dissociate tropical dysentery with abscess of the liver from bacillary dysentery, an epidemic disease that is perhaps allied to enteric fever and Asiatic cholera. It may be well to state that the author is indebted to a manual of bacteriology by Muir and Ritchie for the association of his ideas with the most modern. The following points the three diseases possess in common: the main seat of trouble is the intestines; whilst each has been proved to be due to the presence of a specific bacillus affecting the mucous membrane;

all three fibrillated and motile. Mention must now be made of the *Bacillus coli* which inhabits the soil, and is commonly found in the mucous membrane of the lower large intestines. Dr. Sandwith relates the story of a body of soldiers in Egypt who, suffering from thirst, drank from a festering pool, when most of them developed bacillary dysentery and the remainder enteric. Can it be that under certain conditions what are known as staphylococci and streptococci act upon the *Bacillus coli communis* of the soil and so are produced the *B. dysentericus* and the *B. typhismus ?* For only under certain conditions do epidemics of dysentery and enteric occur. On the other hand, Asiatic cholera is always with us endemic about the Ganges, and whether or not the comma bacillus was formed from the *B. coli communis*, the conditions attached would be water contaminated by the putrefying corpses of Hindus voyaging down the Ganges, for it is customary for the native to rinse his mouth on all occasions when he bathes. But bacillary dysentery occurs in an epidemic form amongst lunatics, and the author, having had much experience of them, expresses the opinion that inasmuch as when a gaol and a lunatic asylum are in juxtaposition, both furnished with the same water supply, the latter cannot be the cause, and it seems clear that given it is a change in the *B. coli communis* that produces the dysentery bacillus, then must we look to the lunatic himself, that is to say, the mucous membrane of his lower intestines, for the place where the *B. coli communis* undergoes its change, and remembering the adage of the ancients that the mechanism of one organ cannot be impaired without another suffering to some degree, and that in lunatics, whether in the form of mania or dementia, the brain, spinal cord, and nervous system generally are at fault, either from hyperæsthenia or æsthenia, then may it not be likely that a certain atonicity of the mucous membrane is caused by brain and nerve waves affecting the vagus and sympathetic? So that under these conditions the *B. coli communis*, always ready to undergo a change, may develop into the bacillary dysentery, and so the disease which is in a measure endemic, like cholera on the Ganges, becomes epidemic, and doctor and nurse and attendant become affected; and a predisposing cause may be errors of diet or constipation, to both of which lunatics are prone.

It may be remarked that whereas in bacillary dysentery the lower gut is affected, in enteric the upper, in cholera the whole is involved, and such of the mucous membrane as is not shed in the way of rice-coloured stools peels off after death in flakes, or the intestines may be found full of fluid.

An unknown factor in the intestinal economy is the solitary gland of Peyer, agminated and surrounded by Lieberkuehn's follicles. The general aspect of Peyer's patches gives us the impression of a secretor or excretor surrounded by a lubricant in the shape of the follicles; and may it not be possible that through Peyer's patches there may be a connection between the three diseases, their affection being apparent in enteric with ulceration, but their function merely destroyed in bacillary dysentery and cholera? Do they constitute a nidus?

During the epidemic at Camp Gharial the author experimented with a view to discovering a specific for Asiatic cholera, and when he contracted the disease himself essayed the same; but first it may be well to describe such treatment as practice and experience has proved to be, if not of the greatest value, then the less injurious.

At the time of the first epidemic that reached the British Isles in 1826, opinion was divided as to whether it were better to check any initial diarrhœa, or at least not to hinder if not to aid the latter. Charles Macnamara made it his practice to carry in his waistcoat pocket some dozen acetate of lead and opium pills (in India at a perhaps later date), whereas Sir Thomas Watson speedily came to the opinion that the materies peccans held its nidus in the intestines and was discharged with the evacuation, and that it also made its home in the blood; therefore, strenuous and heroic as it may seem, and against all our modern ideas, the removal of a pint of blood from the arm in the premonitory or initial stage of the disease was not so much beside the mark as it would appear. The drug administered to remove the poison was calomel, laid on the tongue, and appears to have been given periodically until the algide stage was reached. Then, in the later epidemics a mixture of catechu and chalk, with opium, was employed, to give way later, in India, to chlorodyne, even before the latter drug was admitted into the Pharmacopœia. Of course, rest in bed, with mackintosh sheet, is indicated, hot-water bottles, blankets, and fomentations as occasion may require; that is to say, so soon as reaction is imminent, then will they be in request. The thirst is best alleviated by ice to suck; and it has generally been found that when the patient has a desire for chicken broth, milk, and lime water, liquid or solid jelly, either nitrogenous or saccharine, that the stomach will retain it; but when he evinces no desire it is better not to force him with a feeding cup, but to administer the nutriment by means of a teaspoon. It may be added, however, that if the patient expresses a desire for beef tea, and there be no Liebig's available, in certain cases the stomach will retain ordinary beef tea, or mutton broth without the fat skimmed off. Mutton broth is sometimes well retained. Eau de Cologne on a handkerchief applied to the forehead is soothing, and generally appreciated, although it may not be by those in attendance. Now we come to the mainstay of the treatment, and that is brandy, and its value will depend in a very great measure upon the use or abuse that the patient has made of it in his previous life. It is his sheet anchor, and if he has so accustomed himself to its use, like the opium smoker, it may be necessary to administer the alcohol in such great quantities that when the hoped-for reaction occurs, then will the suppression of urine be accentuated. And it cannot be too emphatically expressed that, as the patient shows signs of returning animation when in the algide stage, denoted by the general signs of the recovery from shock and collapse, the stimulation

of the kidneys should be encouraged by every means, such as fomentations, blister, or cantharides; and if necessary, owing to atonicity of the bladder, the urine should be removed from that organ by means of a catheter. It is surprising the length of time that may elapse before reaction is fully established, and the practitioner should never lose heart, but whilst there is a flicker of pulse, or shadow of heart beat, persevere as he would in a case of ordinary shock with collapse. Electricity, either galvanic or faradic, when available are indicated. Should reaction not be established then coma and death ensue.

As regards medicine to be administered internally, some such draught as the following is desirable, as evolved by the author through induction:—

R	Sp. ammon. co.	ɱxv.
	Sp. æth. chlor.	ɱx.
	Sp. æth. nitrosi	ʒss.
	Tinct. hyoscyami	ɱxv.
	Aq. ad. ʒi, as required.	

If not readily retained the sal volatile may be omitted, and perhaps sp. æth. sulph. substituted.

In the course of the epidemic at Camp Gharial the author, judging from the fact that ipecacuanha is a specific for dysentery and quinine for malaria, cast about for one for cholera, and acting on the supposition that whether a specific be discovered or not, in agreement with Sir Thomas Watson, it is well to eliminate the poison, he administered a pill of colocynth and hyoscyamus, with marked effect, but whilst he was investigating, one morning between two and three o'clock, he awakened to find himself suffering from Asiatic cholera, and he took a colocynth and hyoscyamus pill, with the result that after being assisted back to bed by his native servants he was so far recovered by 7 a.m. the next morning as to be able to mount his horse and ride to the hospital to attend a soldier who had cut his throat; and the latter incident, combined with the fact that the disease was located as far as it is possible to do so to one company, when the latter underwent isolation, prevented further investigation and the experimenting with pills of hyoscyamus and colocynth, hyoscyamus and aloes.

But the author is convinced that here lies a remedy if not a specific for the disease. And at the present moment in his cupboard are colocynth and hyoscyamus pills, Pharmacopœia strength, and others of half strength, colocynth and aloes with the full amount of hyoscyamus.

It may be mentioned that as a prophylactic measure a belt of flannel has been much advocated, but it is well to bear in mind that the object is to keep the abdomen warm and so prevent a chill, and that *per se* it possesses no specific value, such as some believe to be attached to it after the manner of some of the popular belts. As a prophylactic, in barrack-room language, it is well to keep one's pecker up; that is to say, retain one's cheerfulness, and eat at or about the usual. Have no fads. Sterilization of milk —possibly lime-water affects this—and the placing of meat in fly-proof safes; the avoidance of anything in the remotest degree tainted, with the filtration and boiling of all water, of course, are indicated, but the life led should be the normal one, and probably it is better for the moderate drinker to continue his ways, the total abstainer his; but should the latter "fancy" something, then a liqueur glass of whisky, or cognac, with a small soda, is perhaps the best, as a prophylactic measure against the disease, for when those liable to be attacked by cholera are in any way suffering from neurasthenia the not obeying their instincts may produce insomnia, which prolonged may render them irresponsible for their actions, when a debauch or errors of diet may follow. All food should be well cooked, appetizing, all burnt fragments should be avoided, as also should the crust of toast—in fact, anything that is liable in any way to cause intestinal irritation in any form should be most carefully eschewed; for it would appear to be beyond dispute that anything causing the alimentary tract to become deranged will predispose towards the disease, and this in the past has given cause for confusion, and so every case of intestinal disturbance has been classed as choleraic diarrhœa,[1] which, after all, is not such a misnomer as it may at first blush appear, as will be seen in a moment, although the name has given rise to much controversy.

It may be mentioned that Colonel Cunningham, of the Indian Medical Service, has succeeded Charles Macnamara, as far as concerns Asiatic cholera, and the views of the two coincide as to its endemic nature about the Ganges. In the epidemic amongst Europeans at Camp Gharial the author has shown how the disease reached the Jhelum, and then appeared in camp. In the autumn, whilst chikor shooting in the khud below the camp, at the side of the spur running down to the river, he interviewed several natives, and—the matter concluded, so, therefore, no detriment likely to accrue to them from disclosures—the fact was elicited that several villagers had succumbed to the disease between the last case at the Jhelum dak bungalow and its appearance in camp above, where—Gharial being isolated in accordance with the Indian regulations—the disease was confined, and no carrier advanced it further. So that isolation should be practised in all cases, both as regards those affected, and, when practicable a village in the British Isles, or even street when feasible and possible. On all sides it appears to be agreed that Koch's comma bacillus is the materies morbi, but as to the value of the serums that have resulted, opinions are by no means unanimous, and Muir and Ritchie tell us that it is not at all certain whether the bacillus is a toxin *per se*, or causes certain changes. In a word that either the efficacy of the serum as a prophylactic, such as Jenner's vaccination lymph, and typhoid serum, or an anti-serum such as Pasteur's hydrophobia, or anti-tetanus, is non-proven. But the fact has been determined beyond dispute that, given certain conditions such as premonitory diarrhœa, or other disturbance of the intestines, the bacilli thrive and multiply in the mucous membrane

[1] Celsus describes this, if not Asiatic cholera.

of the intestines. And we have seen the close relationship between bacillary dysentery, enteric fever, and cholera, as regards the flagellated nature of the bacilli; whilst again in enteric fever, Peyer's patches are affected, and in cholera the whole intestinal tract suffers, it would appear not unlikely that the prophylactic serum for typhoid in some manner affects the little known agminate and solitary glands of the ileum.

To conclude, the bacillus may be air-, food- or water-borne, prefers a suitable nidus in the alimentary tract to settle in, develop and multiply, is destroyed by heat over 55° C., by sulphur fumes, and by chloride of lime; is affected by cold and frost, but seemingly only suffers from impaired vitality, and may again recover motility; is better removed from the body than checked by astringents; whilst the value of cholera serums has yet to be determined, and possibly one of the components of pil. colocynth and hyoscyamus may be a specific.

Annotations.

A New Missile. — Surgeon Johannes Volkmann (*Münch. med. Wochenschr.*, September 15, 1914) reports thirteen cases of punctured wounds from arrows dropped from an aeroplane on September 1. The missiles were 10 to 15 cm. long, of pressed steel, about 8 mm. thick and weighing 16 grm. The lower part was solid, terminating in a needle point. The upper part of the arrow consisting of a skeletal arrangement of four thin staves, the whole making a star-shaped figure in cross section. The men of the regiment were surprised lying down by sharp sudden wounds suggesting to some that they had been prodded by one of their comrades as a practical joke. The arrows penetrated arms, feet, calves, fingers, ankles, the cheek, the neck, and in one case, the skull, the latter furnishing the only fatality. In some cases the arrows had to be cut out. The treatment consisted in a sterile bandage, and the wounds healed rapidly by first intention. Only one case was treated with tincture of iodine.

Mecca Pilgrims and Cholera.—Ed. Sergent and L. Négre (*Bulletin de l'Office International d'Hygiène Publique* for August, 1914) examined thirty-six pilgrims returned to Algiers from Mecca and thirty-one to Morocco. Thirteen (10 per cent.) had dysenteric bacilli of the Flexner type. The examination of the stools of a number of natives resident in the neighbourhood of Algiers who had not been to Mecca gave a negative result. In three of the returned pilgrims (4·5 per cent.) cholera vibrios were found in the intestines, and in two instances the vibrios presented all the true characters of the cholera vibrio. The pilgrims were all in good health, and the observations show that among those returning from Mecca there are carriers who escape existing sanitary measures.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 1, 1914.

COMMON DISEASES IN TIME OF WAR: ENTERIC FEVER.

OF the many ailments now coming under treatment in our camps and military hospitals independently of shot, shell and bullet wounds, those that stand out most prominently are enteric, dysentery, rheumatism, pneumonia, tetanus and occasionally typhus and cholera; nor is influenza to be forgotten. Amongst men from tropical countries engaged in Europe at present the possibility of malaria recurrences cannot be neglected.

Enteric.—In spite of all methods of investigation as to the evidence of the presence of the typhoid

bacillus of Eberth, none are unfailing except the record of the temperature during the first week. The classical temperature chart, showing a drop of one degree in the morning, and the gain of two degrees in the evening, holds good to-day as it did before blood tests were in vogue. Widal's reaction serves to confirm the diagnosis, and is a useful aid in that direction; but it is no more than an aid, for it is not invariably confirmatory, for or against. The microscope cannot always settle the matter, for the resemblance of the colon bacillus to the typhoid is such that even experts may be misled. Again, in many febrile states besides enteric the sulphanilic and the diazo-reaction tests hold good, so that one has to fall back upon the experiences recorded by Sir William Jenner when he first established the distinctions between typhus and typhoid.

It is needless to go over the commoner signs and symptoms, for although recently qualified men, especially those who have studied in London hospitals, since the disease has well-nigh disappeared in London, seldom see cases of typhoid, still, they are well drilled by their teachers in the subject, for typhoid was *the* disease in the student days of the middle-aged doctor of to-day. Few signs or symptoms occur in a given case of typhoid which may be said to be constant. There may be no rash, or it may prove elusive; the pea-soup stools may never develop, but an annoying constipation may prevail instead; beyond a few vivid dreams at the initiation of the febrile state, there may be neither hallucinations nor delirium. The spleen may not be enlarged to so marked an extent that it can be felt; or if the patient happens to have been in the Tropics the splenic enlargement may be due to malaria. The "classical" tongue is imitated in many fevers; and so with almost every other possible point to be observed, there is no constancy. It comes, therefore, to be a question of a three or four days' careful temperature-taking during the initial phases of the disease to settle the "working diagnosis" that it is typhoid that we are dealing with.

The treatment of typhoid is stereotyped, and consists of milk and beef or chicken tea—about 3 pints of the former and 1 pint of the latter during the twenty-four hours. That this strict routine is wise is more than doubtful; the whole idea is, of course, the withholding of any food that has an indigestible refuse, so that the lower part of the small intestine and the commencement of the colon may not be irritated by its passage, and hæmorrhage and perforation avoided. There are, however, many substances which may be safely administered, which at present are looked at askance. The patient, if thirsty, may be given toast-water, rice tea (rice roasted and then infused in the same way as ordinary tea). Tea itself may be given if made by holding *above* the cup a strainer with a teaspoonful of china tea, pouring boiling water into the strainer and letting the water trickle through into the cup; sugar in plenty may be added to the tea. Home-made lemonade, thin barley water or rice water may also be given. Rice water made by taking, say, three tablespoonfuls of rice in 1½ pints of water, boiling for half an hour or more and then straining off the particles of rice, is an excellent substitute for milk, inasmuch as it is very nourishing and it does not coagulate and clot as milk does. Of more solid substances, junket or curds, barley (not oat) meal porridge, home-made jellies, baked custard and so forth are a pleasant change and at the same time sustaining and harmless to the bowel.

In regard to medicinal treatment, this may or may not be required; when the disease follows a normal course no drug may be needed, but there is no reason why remedies should not be freely given when necessity demands. Delirium may be allayed by the usual remedies; hyoscine, $\frac{1}{100}$ gr. hypodermically, is excellent; and so are bromides, sulphonal, adalin and others given by the mouth. When constipation is persistent, a glycerine suppository may suffice, or castor oil in teaspoonful doses, repeated every hour or two until say 6 drm. are given; or, again, calomel in minute doses of $\frac{1}{10}$ gr. every two hours until an action occurs. When diarrhœa is severe, salicylate of bismuth, in 10 gr. doses in a simple mixture and administered every two, three or four hours, is safe and acts also as an intestinal disinfectant. The question of disinfectants is a constantly recurring question in typhoid and other ailments in which an intestinal flux is a prominent symptom. The difficulty is to reach the affected part, which is always low down in the bowel, and coated capsules, said to be indissoluble in the stomach, are administered with the intent of carrying the drug to the diseased part. Of all disinfectants sulphurous acid in 15 to 30 minim doses, given in a wineglassful of peppermint or dill water every four to six hours, holds a high reputation.

When temperature is high and rising, the hydrochloride of quinine in 3-, 5- or 7- gr. doses, or Warburg's tincture in tablespoonful doses, especially if malaria complicates the disease, are safe; but antipyrin, phenacetin, aspirin, and the like should be avoided as a rule. Sponging the body with hot water may serve to lower the temperature, or if it fails cold water, or equal parts of cold water and spirits of wine may be employed; wet packs or even cold baths may be used, but these necessitate the utmost care and are only expedient in desperate cases, and then only in the earlier stages of the disease whilst yet the heart is able to stand the strain of so drastic a measure In regard to the use of opium it is not forbidden; cough may be allayed by some of the simple forms of cough mixture; a suppository of opium or a starch and opium enema is useful when there is great irritability of the bowel from diarrhœa.

Of the many complications, nose-bleeding, pneumonia, hæmorrhage from the bowel, perforation of the intestine, phlebitis, kidney troubles, bed-sores, each and all call for watchfulness and care on the part of the nurse and doctor. Good nursing, and in that is included accurate observation, is the first and the last word in typhoid fever. Lung troubles are to be avoided by frequent change of position, the patient being gently rolled first on one side and then the other; the back has to be carefully examined

for threatening bed-sores, the stools examined for blood, and the state of the bladder as regards retention attended to. The patient in the height of the disease must never be left unwatched, for collapse from hæmorrhage or perforation may cause an instantaneous collapse.

Vaccine treatment for typhoid has not yet proved its efficacy, but it may be worth trying. The surgeon should be called in when perforation is known to have occurred; and the earlier the better.

Abstract.

GUNSHOT AND BAYONET WOUNDS OF THE STOMACH.[1]

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A BAYONET wound is in all respects similar to any form of stab wound, but the lesions produced by the Lebel bayonet present certain special characters which should be taken into consideration. The Lebel bayonet has four sharp longitudinal projections, separated by four corresponding grooves. The wounds produced in the stomach and intestine are rounded, with irregular and slightly contused borders. A soldier who was wounded by this bayonet in the epigastric region and who died from a wound of the aorta, showed at autopsy that, although the stomach was full of food and completely transpierced, no gastric contents were found in the abdominal cavity. A young girl, who was wounded in the epigastric region by a Lebel bayonet, presented distinct symptoms of gastric perforation but recovered without operation.

Of gunshot wounds it may be said that to-day the armies of all civilized countries employ a pointed projectile of small calibre, having a very great penetrating force. The modern projectile is elongated in shape and of an average calibre of 7 mm.: its length is equivalent to four times its calibre, and it weighs about 15 grm. The nucleus is composed of an amalgam of lead and antimony, which forms a very hard mass, and is covered at the apex at all events—and usually also on its entire surface, excepting the base—with an envelope of hard metal.

The lesions differ according to the distance at which the arm has been fired. Beyond 300 metres, these projectiles produce simple perforations which are small and circular, the bullet entering the tissues like a gimlet, spreading them apart, with the result that the borders of the wound may close together, producing an almost complete occlusion. The opening of the exit of the projectile is generally somewhat larger than that of entrance. When the firing distance is less than 300 metres the lesions vary according to the state of plenitude of the stomach. When the organ is empty the wounds present the same characters as those just enumerated and the resulting disturbances will be slight, but the same cannot be said when the stomach is distended with food, and the result is a genuine bursting of the viscus; it presents large tears and extensive rents.

Gunshot wounds of the stomach are very frequently accompanied with wounds of the neighbouring viscera. When the shot is fired at a moderate distance the projectile generally transpierces the subject, passing through the pleura, lung, liver, spleen, pancreas, kidney, or even the pericardium and heart. The minimum of damage is met with when the projectile enters in the area of Labbé's triangle, an area in which the stomach is in direct relation with the anterior abdominal parietes; but even here the organs situated behind the stomach (kidney, pancreas) will probably be involved. In other instances the track of the projectile in the tissues is much longer, when the bullet follows the axis of the body. This is met with frequently in soldiers who were in the recumbent position at the moment they were shot, and under these circumstances the lesions are multiple and varied. In one case the point of entrance was in the anal region, while the point of exit was found in the left sixth intercostal space in the mammillary line. The bullet lacerated the hypogastric vein, perforated the small intestine several times, likewise the colon and mesentery, and also went through the stomach.

Such cases are of no clinical interest, however, because death occurs before any help can be offered, and although such lesions are frequent on the battlefield, there are fortunate instances in which the stomach alone is involved, or at least represents the principal lesion. It is just these cases that we shall more particularly consider when speaking of the operative treatment, when this can be resorted to with the slightest chance of success, as we shall see.

The *area of gastric vulnerability* corresponds to the projection of the stomach on the abdominal wall. Over the anterior abdominal wall this area has an oval shape with its axis almost vertical, or perhaps it would be better to say slightly inclined from left to right and from above downwards, whose greater extremity occupies the left hypochondrium, while the lesser is situated to the right of the middle line corresponding to the pylorus. Its upper limit is represented by a curved line with its concavity parallel to that of the diaphragm, whose uppermost point is at the level of the left fifth rib in the mammillary line. This point undergoes slight oscillations with the respiratory movements.

The lower limits vary. When the gastric cavity is empty they correspond to a transverse line passing at the point of union of the ninth and tenth rib on each side. When the stomach is distended it becomes displaced downwards; the most declivous point of the full stomach will be found in the neighbourhood of the umbilicus.

The left lateral limit in the state of complete distension becomes confounded with the limits of the hypochondrium. Usually it attains a vertical line, passing slightly to the outer aspect of the

[1] From the *Boston Medical and Surgical Journal*, October 15, 1914.

nipple. The right extremity corresponds to the pylorus, which is also subject to variations, but which in its mean situation is found behind the eighth rib, this point corresponding to the external border of the rectus.

Over the posterior abdominal wall the projection of the stomach affects a shape similar to the precedent. The culminating point of its upper curved limit is at the level of the eighth rib in the left scapulary line. In the middle line, its upper limit, corresponding to the lesser curvature, obliquely crosses the spine from left to right and from above downwards, extending from the left side of the tenth thoracic to the right side of the first lumbar vertebra. When the stomach is distended the lower limit reaches about to the spinous apophysis of the second lumbar vertebra.

Let it not be understood that a wound whose orifice of penetration is located outside the limits of the area here given may not involve the stomach. With firearms this can perfectly well happen, but in this case involvement of the stomach is rather the exception.

Gunshot wounds are the most frequent of any in battle; lesions from the bayonet are the exception. Usually the damage done by the projectile within the abdomen is so extensive that death results at once. A great number of those thus wounded die before they are removed from the field; among those removed a number die from peritonitis, but quite a large proportion recover without operation, and almost all submitted to laparotomy die.

Peritonitis is the only late indication for operating, and in these cases the operative act should be reduced to the minimum, simple incision to let out the pus and drain the peritoneal cavity, without searching for the gastric lesions, which, unlike wounds of the intestine, have a much more favourable evolution. However, the existence of lesions of the neighbouring viscera may create special indications, such as hernia of the intestine and, above all, intra-abdominal hemorrhage. What has been said of gunshot injuries to the stomach applies quite as well to lesions from the bayonet, whose resulting wounds generally have a favourable evolution.

The conservative treatment consists in absolute rest and, if possible, the subject should not be mobilized. This latter is the first condition of conservative treatment. Morphine and opium are to be administered and an absolute diet maintained for the first few days, which should be continued just so long as there is any doubt about cicatrization of the gastric perforation. Usually, feeding by mouth can be prudently commenced by the fourth day, but it may have to be postponed for a week or so. During this time rectal feeding is exclusively employed, along with the subcutaneous administration of physiological salt solution.

There are cases which will die from internal hæmorrhage, if not immediately operated on, and this is the only indication for surgical interference in abdominal wounds on the battlefield. But since a laparotomy is undertaken for the control of the loss of blood, after this has been accomplished, it is better, perhaps, to do a complete piece of work since the abdomen is opened, and close gastric or intestinal perforations when present.

Given a case presenting the classic symptoms of intra-abdominal hæmorrhage, and supposing that the patient can be transported in sufficient time to the field hospital, the proper incision to be selected is in the middle line in gunshot wounds, because by this a much better exploration can be made and the lesions found. The lesions which cause the hæmorrhage may be so serious that even splenectomy or nephrectomy may be required, but wounds of the pancreas or liver can be sutured. Therefore begin at once to examine for the sources of bleeding in the left hepatic lobe, pancreas, spleen and kidneys, because gunshot wounds of these viscera are detected by the flow of blood. When this has been found and the proper treatment applied, one can next proceed to explore the small intestine for perforations, never forgetting the duodenum. Then the stomach is next examined, never neglecting the examination of the posterior gastric wall as well.

In bayonet wounds the exploration of the abdominal viscera need not be quite so complete, because multiple lesions from this cause are infrequent; but, nevertheless, the arm may enter deeply and involve deep-seated structures, such as the splenic or renal vein. Examination of the small intestine need not be resorted to, as multiple perforations from stab wounds are practically unknown. When the hæmorrhage has been controlled and the gastric perforation found, you will proceed to deal with it. Thoracotomy in wounds in which the bullet enters through the thorax into the abdomen is too formidable an operation to be done in a field hospital.

Gunshot wounds of the stomach usually penetrate both walls of the organ, and median laparotomy is the proper incision. Other incisions may be of advantage in some few cases in civil practice, they have none in the surgery of war. By the median incision the left hepatic lobe, stomach, spleen, and pancreas, likewise the kidneys and intestine, can be thoroughly explored. But in bayonet wounds median laparotomy is to be done only when the wound is in the neighbourhood of the linea alba, otherwise the incision should be made at the point of abdominal perforation, since one has not to search for multiple lesions. When perforation of the posterior gastric wall occurs it is generally seated directly or nearly opposite the anterior perforation, so that it can more readily be discovered by posterior exploration. The intestine is rarely involved and in the few cases where this has been the case the transverse colon has been the organ injured. In cases where the wound is situated in the left flank the abdominal incision made parallel with the costal border is to be preferred, as it gives an easier access to the hypochondrium and subphrenic region. Should more space be required during the operation a medium incision can be advantageously added.

The exploration of the anterior surface of the

stomach is usually easy, excepting in the region of the cardia. The gastric perforation usually comes into view when the abdomen is opened, but when it is very small, as is sometimes the case, it must be searched for with much attention. Occasionally, it is seen in the form of an ecchymosis, which must be closely examined in order to discover the perforation. Sometimes it is hidden by a blood-clot, or it may be concealed in a gastric fold. In order to expose the perforation in the latter case, the gastrocolic ligament is incised, and by introducing the hand behind the stomach the anterior surface is unfolded and the perforation brought to light which would otherwise escape attention.

The projectile generally perforates both gastric walls, and the orifice of exit is usually seated in the posterior wall. In bayonet wounds the anterior perforation is usually the only one, but it must be recalled that perforation of the posterior wall occurs in about 10 per cent. of these injuries. Therefore, the surgeon must not omit exploration of the posterior wall in these cases. Extragastric exploration is a necessary step in the interference in both gunshot and stab wounds, and this is done through the gastrocolic omentum, but when the perforation is near the lesser curvature it is, perhaps, better to go through the gastrohepatic omentum. By this latter route it is easier to suture a wound of the pancreas. An incision in the transverse mesocolon may sometimes be preferred. But these are not methods of choice, because by the former the access is difficult and does not allow one to explore the entire posterior gastric wall, while in the latter, if the opening is at all large and this is necessary, there is danger of injuring the vessels of the mesocolon. It is also better to avoid working in the lower part of the abdomen, necessitated by this technique, particularly when the case is one of stab wound which does not require examination of the small intestine. Therefore, incision of the gastrocolic omentum will be the method of choice, and with a large opening it is sufficient for all operative work, and involving several of its vessels will not compromise the vitality of the great omentum.

When the perforation is in the middle or lower portion of the stomach it can readily be seen and closed through a relatively small opening made in the ligament with forceps, but the same does not apply when the perforation is seated high up on the posterior wall near the cardia. To accomplish a good suture here, the stomach must be turned upwards in order to expose its posterior aspect thoroughly. The costal borders hinder the operation, and it is for this reason that several types of resection of the costal cartilages have been described; but I do not hesitate to say that by median laparotomy perforations situated high up can be sutured, on the condition that the opening in the gastrocolic omentum is sufficiently large.

It is well to make it extend from the pylorus to the left angle of the colon, and thus one can quickly explore the posterior aspect and carry out a careful cleaning of the retrogastric space. Gangrene of the greater curvature need not be feared if the opening is made 2 cm. from the stomach, so as to avoid the gastro-omental arteries.

In some special cases extragastric exploration will be sufficient, in which case gastrotomy is to be resorted to, but before doing this a cushion should be placed under the lumbar region, which may render the examination easier, and the endogastric procedure may not be required. However, should this be deemed necessary, the incision in the anterior gastric wall should be horizontal, at least 3 in. long, and made at equal distance from the curvatures. Introducing the hand behind the stomach, the posterior wall is made to protrude through the gastric incision. The mucosa is wiped with compresses, after which the surface is examined. One may thus discover an ecchymosis or a perforation which would otherwise have been overlooked.

This technique, which in gastric ulcer is rather simple, is less so in traumatic perforation, because in the former the gastric cavity is apt to be empty, while very frequently the stomach is full at the time the gunshot injury is received. This being the case, the contents must be removed through the incision, with all due care not to let any of it escape into the peritoneal cavity. Very few surgeons have resorted to endogastric exploration in gunshot wounds, and when it has been done, the incision in the anterior wall has been timidly made, with the result that the posterior perforation has been overlooked. In the case of President McKinley, the anterior perforation was simply enlarged and the gastric cavity explored with the finger, and the posterior perforation was only discovered by a direct examination of the posterior wall.

It is true that simple inspection of the outside of the stomach wall may fail to reveal a perforation, and this happened in several cases, but it is uncommon. Always remember that the perforation in the posterior wall may be in the duodenum.

There is one lesion that may require gastrotomy for its discovery—contusion of the posterior gastric wall from the projectile. This lesion is uncommon, but it is often the cause of hæmorrhage and ulceration. It is also indicated when external exploration does not reveal any lesion sufficient to explain the symptomatology; when, for example, there is free hæmatemesis due to contusion of the stomach without perforation of the organ. This has been observed in practice. As can readily be seen, the endogastric exploration has a limited field of usefulness, but occasionally it may be required.

The closure of the perforations is the same in gunshot wounds as in any perforation of the gastrointestinal canal. When there is much contusion of the borders an economical resection of the exuberant mucosa is indicated. When the opening is at the pylorus or cardiac end of the stomach the sutures should be placed perpendicularly to the axis of the portion involved, in order to prevent stricture. If the loss of tissue is considerable, it is better to suture the perforation to the skin in order to save time. When there is a simple abrasion of the outer coat of

the stomach it should be buried under a peritoneal suture in order to avoid future complications.

Free drainage of the abdomen is absolutely necessary, no matter how small the perforation, and should be established in those regions where liquid is most prone to accumulate, the left hypochondrium for perforation of the greater curvature, the space comprised between the liver and stomach in perforation of the anterior gastric surface and lesser curvature.

For posterior gastric perforation the retrogastric area must be drained with care, the best manner being through a lumbar incision. It can be done, however, through an incision in the gastrocolic ligament. Packing the retrogastric space may be necessary for controlling slight bleeding from a sutured pancreatic perforation. Absolute quiet is essential for the first few days, and feeding by mouth can usually be begun on the fourth day, but should vomiting occur it must be stopped at once and not again attempted for several days.

Gunshot perforations of the stomach, as met with in the field hospital, should never be treated surgically unless laparotomy is indicated for intra-abdominal hæmorrhage, as more lives will be saved under the circumstances by a careful conservative treatment.

Reprint.

THE ARMY AND MENTAL DISEASE.[1]

THE mental anguish, depicted by the numerous tales of suicide, madness and desertion among soldiers, to say nothing of mental frenzy expressing itself in wanton murder, that have come to us from our ill-fated friends across the sea, leads us to realize that there have been made as yet no scientific studies of the effect of war on the minds of officers and enlisted men in the army. Fortunately for our nation, there has been no opportunity to study the effect, on a large body of men, of short rations, loss of sleep, great emotionalism, exhausting exposure, excessive physical exertion, home-sickness, &c.; yet these in combination produce a strain that might well prove fatal to the equilibrium of many a mind that in regular routine would show no weakness. To be mentally sound in such conditions is of more importance than to pass the eyesight test, or to be typhoid proof.

In the light of modern psychiatry it is rumoured that more than one great battle has been lost by a general who was in the early stage of paresis, and doubtless dozens of men who have met the fate of deserters had their doom written in their brains, could their officers have read the signs of dementia præcox. Although the mental effects of war strain have not been studied, our War Department has been carrying on, under the Surgeon-General's advice, a very interesting inquiry concerning the mental status of the army.[2] The studies show that the mentally diseased, and those who are congenitally or otherwise mentally defective, form an important problem in armies and navies.

Of all the discharges for disease or external causes, practically speaking, one-fifth are on account of mental disease in some form. That is to say, out of 1,062 men discharged in 1912 on account of disability from all causes, more than 200 were found to be mentally diseased or defective during the year; and these did not include the retirements for neurasthenia or hysteria, which, although the patients are not insane in the accepted sense, are in reality mental diseases that will seriously affect one's efficiency in time of strain.

Of all the mental diseases, it was found that dementia præcox was by far the most frequent form; it averaged about 56 per cent. each year of all the dismissals. In addition to these, there is no knowing how many cases there might have been among the soldiers who deserted through the year, or were dishonourably discharged on account of "previous convictions by summary court," or who attempted suicide. Many of them, without doubt, had mild or unrecognized cases of dementia præcox.

The report gives a clear, concise outline of the modern conception of dementia præcox, explaining the way in which it may appear in the army in young men who have never shown any of the symptoms of irresponsibility when sheltered by their parents or friends, but who cannot "get along" when they are required to speak, act, and even think in prescribed and orderly fashion.

The symptoms, with the vivid case descriptions that follow, will afford the regular army surgeon much insight into cases that would seem to be merely undisciplined. In fact, the text of this bulletin will be of tremendous social value to every officer, as well as to anyone dealing with large bodies of men, whether in reform schools, prisons, factories or mines.

In the same clear, concise manner, paranoid mental states are treated, also manic depressive psychoses, general paresis, syphilis of the nervous system, arteriosclerotic mental disturbance, hysterial psychosis and the constitutional psychopathic states.

It is interesting to note that the military prisons frequently turn over men who have been convicted for desertion, assault, murder, theft, who were probably at the time suffering from mental diseases that were not recognized until they became so pronounced that the prisoners had to be sent to the Government Hospital for the Insane.

Even despite the advice of experienced alienists, men are condemned to death by jurors instructed by lawyers who fail to grasp the significance of these peculiar disturbances in the emotional sphere—delusions, hallucinations and sexual perversities. The pages of this bulletin would be excellent reading for the occupants of the jurors' box in a criminal law court; for what holds true of enlisted men matches up in a pretty fair average to men in general.

[1] From the *Journal of the American Medical Association*, October 17, 1914.

[2] King, E.: "Mental Disease and Defect in United States Troops," *Bulletin* 5, Dept. of War, Washington, D.C.

Original Communications.

THE OCCURRENCE OF CERTAIN STRUCTURES IN THE ERYTHROCYTES OF GUINEA-PIGS AND THEIR RELATIONSHIP TO THE SO-CALLED PARASITE OF YELLOW FEVER.

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It has been claimed by Seidelin, and later by Macfie and Johnston, that certain structures seen in the red blood corpuscles of yellow fever cases and called by them *Paraplasma flavigenum*, are inoculable into guinea-pigs, and can be passed on by subinoculation from one animal to another. In consequence of these and other results they consider that they are dealing with a definite parasite, the etiological factor of yellow fever.

In inoculated guinea-pigs these bodies are never present in large numbers, and it occurred to us that, before accepting these conclusions, it would be well to make a careful study of the blood of normal guinea-pigs in a country where yellow fever does not exist. Accordingly we have made minute examinations of healthy guinea-pigs of all ages born and bred in London.

The results obtained in these examinations are of extreme interest, for they have shown, as we suspected, that the erythrocytes of apparently normal and healthy guinea-pigs contain in small number minute bodies, which, as far as we can judge, are identical with the structures described by the authors already mentioned in their inoculated guinea-pigs. Such observations are not altogether new, for Agramonte and Schilling-Torgau have already recorded similar results in their examination of animals. A brief mention of our examination of normal guinea-pigs and the discovery in them of these bodies has already been made (*Lancet*, May 9, 1914, p. 1357).

The difficulty of describing such minute bodies verbally has led to contentions as to the identity of the structures dealt with by the various authors. In order to reduce such difficulties to a minimum we have reproduced a coloured plate of red blood corpuscles drawn from films of guinea-pigs' blood, stained by methods practically identical with those recommended by Seidelin, and painted by the same artist (Miss Mabel Rhodes) who produced the skilful drawings illustrating Macfie and Johnston's paper. The magnification employed is also the same as that of the corpuscles in the plate illustrating the last mentioned paper. If anyone interested in the subject will compare our plate with that one, and with those produced by Seidelin, they cannot, we think, but be convinced that we are dealing with similar bodies.

Description of Bodies in Normal Guinea-pigs.

The bodies occur most commonly in very young guinea-pigs, and against their parasitic nature is the fact of their being in largest number in the newly born animals, for it will be remembered that the occurrence of placental transmission is exceedingly rare in the whole realm of parasitology and does not occur in piroplasmosis, trypanosomiasis, and other protozoal diseases. In films of such blood, if suitably stained, it will be found that nearly every red cell exhibits one or more small red granules varying in size and in position in the cell. They are evidently structural elements of the erythrocyte and are not found free in the plasma. Some of these resemble very closely the red granules depicted by Seidelin in some of his plates. Their probable explanation is to be found in the development of the red cell from a nucleated corpuscle, that is to say, they represent some form of nuclear remnant, an idea suggested by Schilling-Torgau. As the animal increases in age the granules diminish in number till eventually they become difficult to find. The majority of these granules appear to be perfectly homogeneous and refractile and have no other structure attached to them, though in certain focus the appearance of a whitish halo around them may be detected—this is probably physically produced. In certain instances the red granule may show a central more deeply staining spot, as in fig. 35 of Macfie and Johnston's plate of the dog's blood. A fairly common feature of the red dot is the association with it of a bluish-grey material which has the appearance of protoplasm, and it is to these forms that special attention has to be directed on account of their close resemblance to some of the piroplasmata. The exact arrangement of this substance is variable, and the appearance of a vacuole may often be noticed in it. The nature of this blue-grey substance is difficult to determine—Schilling-Torgau considers it to be the remains of the central capsule, part of the archoplasmic body of the immature red cell, but it must be admitted that such an explanation is hypothetical and somewhat difficult of proof. It does seem, however, that in some cases it has a connection with a basophilia of the red cells, certain of which are seen to be dotted over with irregularly shaped blue-grey patches varying in number from a single one to fifty or more. If one of the red dots, described above, should be associated with one of these patches of basophilic change there would be produced bodies which would have a striking resemblance to minute piroplasmata. It is possible that some of the bodies are produced in this way, but the explanation will hardly account for the very definite appearance of the rod-shaped and ring-like bodies described below.

In some instances the blue-grey substance leads away from the dot as a comma-shaped tag (see figs. 1 and 2), in others it is rod-shaped with the dot in

* This work was begun at the London School of Tropical Medicine, but has since been much extended at the Wellcome Bureau of Scientific Research.

the centre or at one end (figs 3 to 8). In the rod-shaped forms two red dots may be present instead of one (fig. 9) while the rod itself instead of being straight may be curved to produce a sickle shaped body (figs. 10 and 11). Frequently, however, the blue-grey substance is roughly the shape of a triangle with its base separated from the dot by a clear space, the two angles continuing on to enclose the dot (figs. 16, 17 and 18), giving the appearance of a ring, very much like a malarial ring in miniature, with the side opposite the chromatin dot much thickened. Sometimes it is impossible to make out any connection between the red dot and the blue-grey substance (figs. 14 and 15). This may only be due to the minuteness of the structures examined, or, on the other hand, there may be a real lack of such connection owing to the fact that the appearance has been produced by the accidental association of a red granule with a blue patch of basophilic change on the red cell, as explained above. In many cases, however, ring appearances are produced without any marginal thickening (figs. 19, 20 and 21), while irregular forms are frequently seen (figs. 22 to 27), and also more compact and solid looking bodies (figs. 28, 29 and 30).

From the above description it might be thought that the chromatin-like part is always a single granule, but this is not so; sometimes it is a more irregular chromatin mass which appears to be made up of a group of small granules (fig. 12).

The forms we have just been considering are very much smaller than the smallest malarial parasite, but occasionally larger ones are met with; such a one is figured in our plate (fig. 13). It is possible that these larger forms are of a different nature, and, in fact, the extreme polymorphism of the bodies suggest that they may not all be produced in the same manner.

Recapitulating, therefore, the following different types of bodies may be found in the erythrocytes of normal guinea-pigs.

(1) The highly refractile red granule which in certain focus appears to be surrounded by a white halo and sometimes has a more deeply staining central dot.

(2) Blue rod-shaped forms with one or more red granules in the middle or at the ends.

(3) Blue ring-shaped forms with thickened blue area opposite red dot.

(4) Large and small blue ring forms of more uniform outline and lateral red dot.

It must be remembered that one is dealing with extremely minute structures, and sometimes their differentiation from artefacts is by no means easy even to those who have specially studied the subject. Even allowing for this we would insist that the majority of the bodies are definite structures forming part of the erythrocyte and are not artefacts which have become accidentally adherent to these in the process of film making. Some of them may result from a degenerative or basophilic change in the red cells, others may be remains of the red cell nuclei or other structures which go to make up the complicated ideal erythrocyte of Schilling-Torgau. It should not be forgotten that they occur in largest number in the very young animals whose blood approaches the embryonal type where developing erythrocytes appear in the circulation more commonly than in older animals.

It is to be expected that similar bodies will be found to occur in the blood of other animals. Macfie and Johnston have described such for dogs and rats. This fact must be borne in mind when one is dealing with animals which are known to be liable to piroplasma infection; for this infection in itself, by producing a blood change, will tend to increase the number of pseudo-piroplasmata present. One must be very careful to distinguish these from true parasites and must not be carried away by a superficial resemblance in colour, which is merely an accident of their chemical nature.

The Supposed Inoculation of Guinea-pigs with the so-called Yellow Fever Parasite.

Seidelin and those who have followed him have inoculated guinea-pigs with blood from yellow fever patients and have found in the red cells of these inoculated animals bodies which are indistinguishable from those described by us above. They claim that these have been inoculated from the patients suffering from yellow fever and represent the parasite causing that disease. They made no mention of the fact that normal guinea-pigs harbour such bodies. It is evident, therefore, that they have not sufficiently controlled their results by the examination of normal uninoculated animals, and their supposed inoculation of the parasite of yellow fever into healthy guinea-pigs is thus quite without foundation. We are convinced from our observations on numbers of normal animals that the guinea-pigs used by them must have harboured these bodies before they were ever inoculated, and their mistake has arisen through the resemblance of these to the paraplasma bodies seen in yellow fever cases.

The so-called Parasite of Yellow Fever.

In this short paper it will not be necessary to go into the literature of the subject of the so-called parasite of yellow fever in detail as this is sufficiently well known to students of yellow fever. Suffice it to say that Seidelin in 1911 showed specimens before the Society of Tropical Medicine and Hygiene of small bodies in the red cells of yellow fever cases, and put forward the idea that these were parasites and the cause of the disease. Subsequently he published several other papers elaborating this view. After this Schilling-Torgau in Germany discussed the subject and showed that similar bodies might be demonstrated in the blood of different diseases, and he finally came to the conclusion that the bodies were in all probability associated with the development of the erythrocyte. Some correspondence took place between Seidelin and Schilling-Torgau, and then Agramonte, in Cuba, published a paper on the subject. In this paper he criticized the bodies very strongly and brought forward many points against their being parasites. Other writers in that island, Cartaya, Guiteras, &c., also demonstrated the presence of

what they considered similar objects in the blood of people not suffering from yellow fever.

Seidelin, however, after examining specimens of the bodies seen by other observers, concluded that they were not the same as his. Here the matter remained for some time, and might have gone on doing so for ever had not Seidelin gone a step further and claimed that he had found similar bodies in guinea-pigs inoculated with yellow fever blood, in fact, claimed that he had produced yellow fever in guinea-pigs. Such a statement is, of course, not only an important one, but a serious one as well, as, if proved to be true, it means that the lower animals can suffer from yellow fever and may act as reservoirs or carriers of the germ. These results of Seidelin have been confirmed by Macfie and Johnston and by Seidelin himself working in West Africa. We have now, however, shown that these authors were mistaken in supposing that the bodies seen by them in yellow fever are inoculable and undergo multiplication in guinea-pigs, and as this supposed transmission was one of their chief arguments in favour of the parasitic nature of the bodies, the point now arises are these structures in yellow fever cases parasites at all? The bodies we have found are present so constantly in newly born guinea-pigs that the parasitic theory becomes untenable. Therefore we would suggest that the similiar bodies found in yellow fever cases are likewise non-parasitic, this harmonizing with the findings of Guiteras, Schilling-Torgau and others who have demonstrated them in diseases other than yellow fever.

Seidelin's position is this, he describes certain structures in the red cells of yellow fever cases as parasites of the disease, and, as Agramonte suggests, places himself in an unassailable position by assuming that the bodies found by others, who do not support him, are not identical with his own. Furthermore, in his examination of the children in schools in Mexico, he demonstrated his bodies, though the children were not suffering from any recognizable disease. Instead of accepting this as affording evidence against his theory, he argues by analogy with considerable skill, but without the production of any proof, that these children are really carriers of the parasite. Again, in his own case, he suffered when in Mexico from a very mild febrile attack, a common enough condition in those residing in tropical climates. On examining his blood he encountered his bodies in larger number than in most of the severe cases of yellow fever examined by him. He himself had admittedly suffered from an attack of yellow fever some years before, and but for the finding of the bodies in his blood we are sure would never have diagnosed his complaint as yellow fever. Still more remarkable is his most recent announcement of his reinfection with the yellow fever parasite by inoculation of blood of a supposedly infected guinea-pig. If this were true, it would mean a third attack—a most unlikely occurrence. Seidelin, having accepted the parasitic nature of his yellow fever bodies, is forced to diagnose yellow fever wherever he sees his parasite, and this has led him into some difficult positions out of which he tries to extricate himself by drawing analogies from malaria and other diseases. For instance, a Chinaman in Jamaica was diagnosed as suffering from yellow fever because of the presence of such bodies in his blood, without there being yellow fever in the island at the time. He might with more reason have accepted this case as refuting his theory. Still further, Macfie and Johnston, finding similar bodies in the blood of stray dogs, have guardedly suggested that this animal is a carrier of the disease. In view of the fact that our bodies are identical with theirs, we might just as well say that guinea-pigs all over the world are carrying the virus, and that only in certain countries are they being conveyed to man and producing yellow fever, unless one assumes that guinea-pigs in yellow fever countries harbour the yellow fever parasite, while in other countries they have a morphologically identical parasite which is not the yellow fever one. Such positions no one would be foolish enough to adopt. The extreme of the position is reached when it is suggested by Seidelin that a protective inoculation against yellow fever should be undertaken by suitably injecting the blood of supposedly infected guinea-pigs.

The Value of these Bodies as a Diagnosis of Yellow Fever.

From what we have already said, and from the examination of films from yellow fever cases, we are convinced that these are of no value as a means of diagnosing this important disease, and this quite apart from the fact that other observers have found them in most varied conditions. We would, therefore, warn those who have not had many opportunities of making such minute blood examinations from accepting the presence of such bodies as a clinical test of yellow fever. The bodies are so minute and obscure that a specially trained expert is frequently in doubt as to whether they are purely artefacts or not. We absolutely fail to see how it is possible for Seidelin to detect and identify such bodies amongst the cellular and granular contents of a section, especially one stained by the iron hæmatoxylin method. It is perhaps only just to remark here that the bodies described by Macfie and Johnston present a much greater uniformity of structure and appearance than the heterogeneous collection of structures which Seidelin serves up for our consumption as the organism of yellow fever. Though it is extremely difficult to depict such bodies even in a coloured plate a very little experience in blood film work would convince anyone examining Seidelin's figures that many of them represent nothing more than artefacts which have been produced by the process of film making. We would undertake to find in the smears of any organ, the stomach included, bodies which no one could possibly distinguish from those described from similar situations by Seidelin, who seems resolved to work into the life cycle of his hypothetical parasite every particle of blue and red staining substance he can pick out of films, smears and sections, regardless of the fact that these may

be merely physiological or degenerative cell granules, broken bits of tissue cells, or even parasites of a totally different nature.

Seidelin has, however, done one service in showing that by the expenditure of extreme patience and laborious care, it is possible to find such bodies in human blood, and we feel convinced that if anyone cares to expend a similar amount of trouble in the examination of diseases other than yellow fever they will meet with similar reward.

What are the Bodies in Yellow Fever Cases?

We have already stated, in reference to guinea-pigs' blood, that the bodies found there, though not parasitic, are still definite entities, and cannot be regarded as artefacts. We believe similarly that in yellow fever cases many of them have to do with the development of the erythrocyte from a nucleated red cell, though in some instances they may represent basophilic or other degenerative changes. The occasional presence of nucleated red cells in the blood of yellow fever cases, as recorded by some observers, seems to indicate that a change has taken place in the development of the erythrocytes, a change which is not remarkable in view of the severe toxæmia which exists in this disease. It is not surprising, therefore, that prolonged search reveals structures like those described above. What does seem strange is that the blood, when subjected to such a severe toxin, does not reveal more evidence of erythrocyte degeneration. It will be remembered that Guiteras, Cartaya, and Agramonte found similar structures in diseases where there had been anæmia or severe toxæmia. These conditions tend not only to stimulate blood production, thereby increasing the possibility of nuclear remnants occurring in the circulating cells, but the toxic substances themselves also are likely to produce degenerative changes by a direct action on the red cells. A further study of the exact nature of these bodies would be of interest, with a view to determining whether they are developmental or degenerative in origin.

Conclusions.

(1) In the blood of normal guinea-pigs, born and bred in England, are to be found bodies indistinguishable from the so-called *Paraplasma flavigenum* of Seidelin.

(2) In most cases these appear to be definite structures which probably have to do with the development or degeneration of the red cells.

(3) They are not parasitic because they occur in the blood of newly born animals, not forgetting even the possibility of a placental transmission.

(4) The apparent success of the inoculation into guinea-pigs of such bodies from yellow fever cases is due to a failure of a sufficient examination of control animals.

(5) The evidence in favour of the yellow fever bodies being parasites thus breaks down.

(6) The presence of such bodies in yellow fever bears, therefore, no diagnostic significance apart from the evidence of blood alteration.

(7) It is frequently impossible to separate real bodies from pure artefacts, a fact which renders their differentiation one of extreme difficulty.

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THE TRANSMISSION OF *TRYPANOSOMA BRUCEI* OF NIGERIA BY *GLOSSINA TACHINOIDES*, WITH SOME NOTES ON *TRYPANOSOMA NIGERIENSE*.

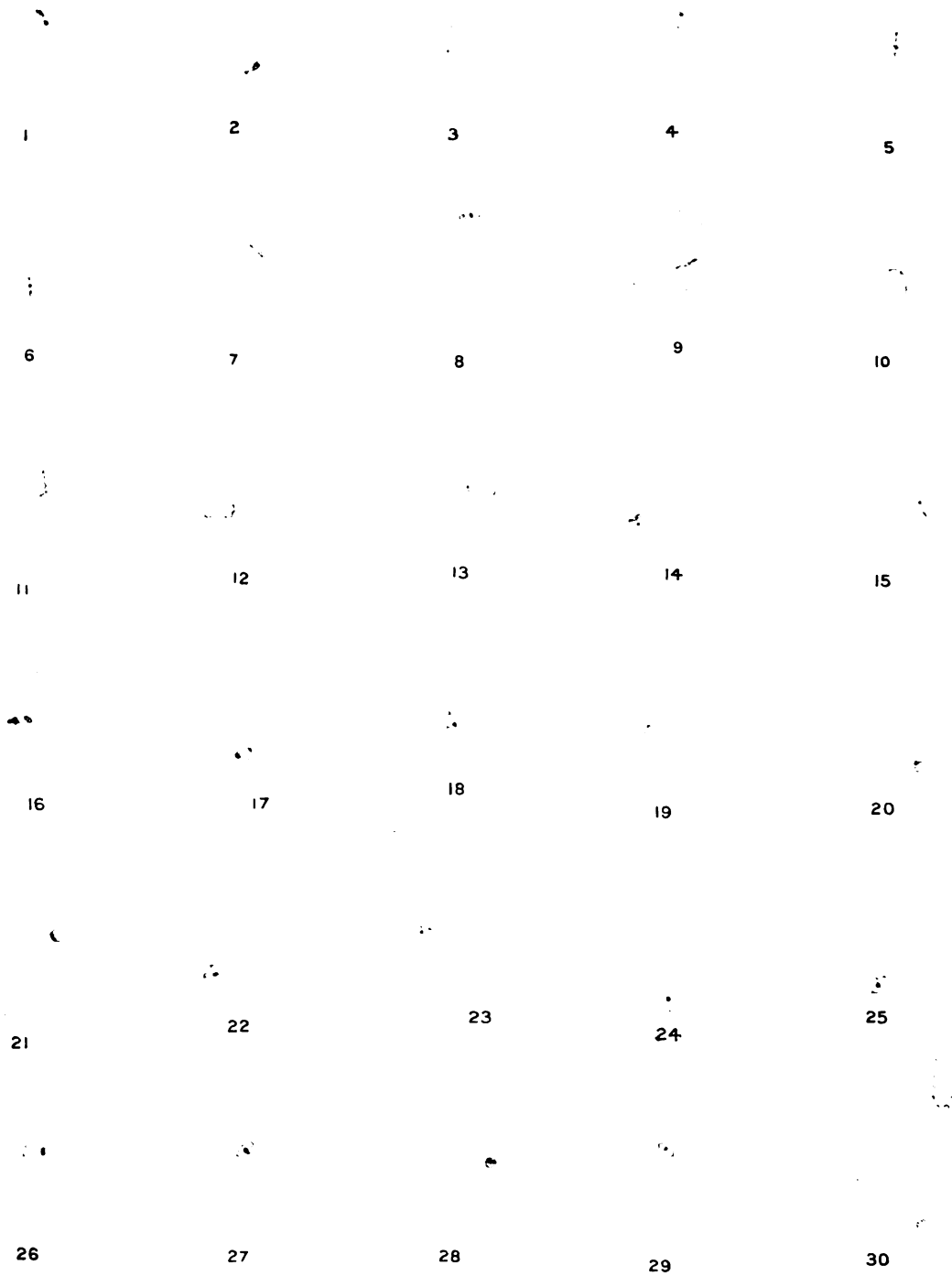
By G. H. Gallagher, L.R.C.P.S.I.

Medical Officer, West African Medical Staff.

(*From the Wellcome Bureau of Scientific Research.*)

During my last tour in Nigeria I was placed in charge of the Sleeping Sickness Camp at Eket. This district lies in the eastern division of the southern provinces of that colony. The southern border of the district abuts on the sea which inundates some considerable portion of that section of it. No part of the district is much above the sea level and a profuse network of streams intersect the centre of it. As a result of this vegetation is marked, especially the palm tree and the short thick scrub which grows so readily during the years the land lies untilled. Here, as may be conjectured, is the ideal haunt of the tsetse, and in former days when game must have been more plentiful than now, the country must have been a veritable Eden for them. As a matter of fact, glossinæ are not very plentiful—at any rate in comparison to the well-known fly-belts of the Congo and East Africa—and rarely is one annoyed by these pests along the Government road which passes east and west through the middle of the district.

A few words as regards the distribution of the tsetse-fly may be of some interest. I have failed to find any mention in the literature on the subject of existence of *Glossina tachinoides* or other tsetse in the Eket district, though my predecessor, the late Dr. Foran, in his various reports while he was in medical charge of the Sleeping Sickness Camp,



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To illustrate paper, "The Occurrence of Certain Structures in the Erythrocytes of Guinea-pigs and their Relationship to the so-called Parasite of Yellow Fever," by C. M. WENYON, M.B., B.S., B.Sc., and GEORGE C. LOW, M.A., M.D., C.M.

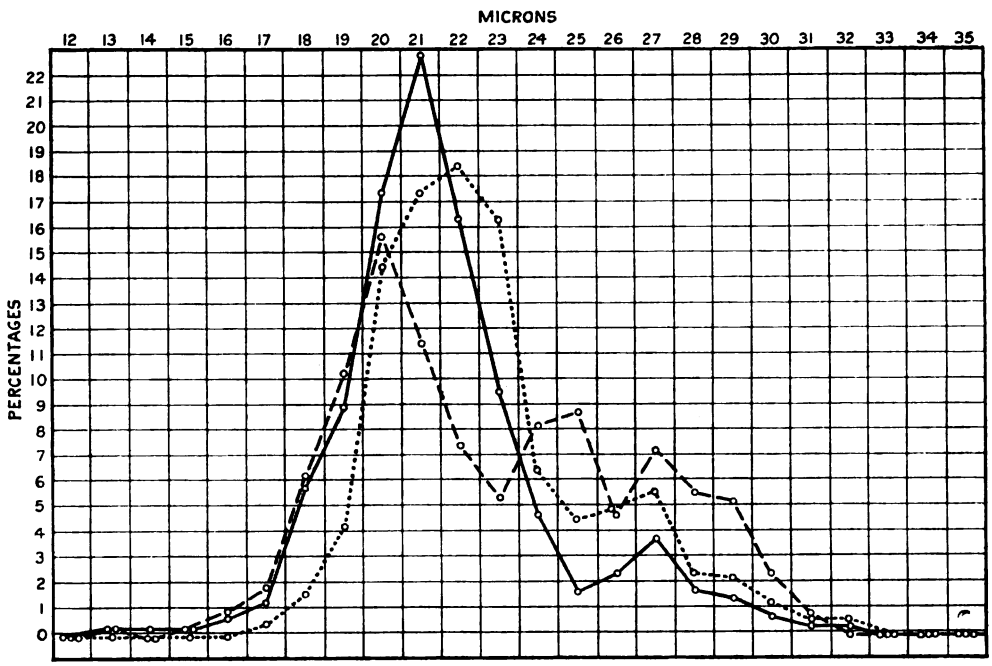
repeatedly pointed out that this fly was very prevalent there. Later, Dr. Macfie, I believe, sent home specimens of the fly which have been identified. Next in order of numbers come *G. palpalis* and *G. caligenea*, though these are more plentiful nearer the two larger streams to the east and west of the district.

It was from such ideal surroundings that I obtained two strains of trypanosomes (a third strain, probably *Trypanosoma nanum*, obtained by feeding *G. palpalis* on a clean guinea-pig, was lost owing to failure in sub-inoculating) which were brought home for further identification and study.

Description of the Parasite.

The living trypanosomes, though freely motile, show little translatory power, and the shape and size of the body, presence of the nucleus and the long free flagellum (when present), can easily be made out, the undulating membrane being thrown out in sweeping waves.

In stained preparations the parasite appears to be of the classic polymorphic type showing the three characteristic variations in shape and length, namely, (1) long and slender, with long free flagellum, (2) short and stumpy with little or no free flagellum,



(1) Black line is constructed from 1,000 individuals from Rats II, III, IV and V.
(2) Broken line ,, ,, 500 ,, ,, Rat V.
(3) Dotted line ,, ,, 250 ,, ,, Rats II and III.

STRAIN I.—*Trypanosoma brucei.*

It may be well to state here that what I take to be *T. brucei* is a polymorphic trypanosome of the type consistently figured and described under that name by Sir David Bruce in his various reports.

The existence of such a trypanosome, showing posterior nuclear forms, was first mentioned by Scott-Macfie from Northern Nigeria in 1912 [1]. The diagnosis of the parasite was based, apparently, on its morphological character, and a certain number of inoculations of it into guinea-pigs and rats.

The strain of *T. brucei* which this paper refers to was obtained by feeding 128 *G. tachinoides* on a clean guinea-pig. This animal was first found infected on May 2 this year, and died on my voyage home on July 25. Another guinea-pig was the next day inoculated from it, and when first examined, on September 2, was found to be infected. Since that date the trypanosome has been maintained in white rats.

including the posterior nuclear variety, and (3) the intermediate forms.

These three forms were always present at some time in the life of an inoculated animal though in varying proportions. Speaking generally, it was found that the first few days of infection showed a preponderance of the long, slender type and that as the infection grew the numbers of the short stumpy and of the intermediate forms increased, so that in some cases, where the infection became relatively chronic (as in Rat IV), these forms seem to become the dominant type. With regard to the posterior nuclear forms there is even a greater want of correlation here. One animal may show this type quite early in the disease, in another their appearance may be delayed. Again, as pointed out by Wenyon and Hanschell [2] to be the case with *T. rhodesiense*, the relative proportions of posterior nuclears to the other types show marked variations. For instance, counting a thousand trypanosomes on

approximately the same day and intensity of infection Rats IV and V gave the following relative percentages: Rat IV = 0 per cent., Rat V = 36·5 per cent. Further prolonged search in the case of Rat IV revealed only one posterior nuclear form, though there were approximately 200 parasites in every field of the microscope. Coincidentally it may be stated, for the support of those who look on these forms as an index of virulence, that Rat V lived thirty-six days, whereas Rat IV lasted for fifty-nine days, though it would be only fair to point out that Rat IV was inoculated from Rat III when only one trypanosome was found by coverslip examination, whereas Rat V was inoculated from Rat III after death of the latter, when the trypanosomes were very numerous.

Curves showing the percentages in length of this trypanosome show that the parasite varies in length from 12 μ to 32 μ, while the greatest number measure 20 to 21 μ.

Three curves are given on the previous page—one in black represents a thousand individuals taken at odd times and varying numbers from Rats II, III, IV and V; the second, in interrupted lines, is the curve of 500 individuals (a hundred being drawn on five successive days) from Rat V; the third, dotted lines, is the measure of 250 individuals from Rats II and III. It will be seen that they vary somewhat, there being a marked difference between the first and second curves, while the third occupies an intermediate position. This marked difference of the second curve is only to be accounted for by the extraordinary number of posterior nuclears in Rat V, which as stated above reached the high percentage of 36·5.

Comparison shows these curves to be very similar, if not identical, with those drawn by Sir David Bruce from his Zululand strain [3]. This similarity in morphology of the trypanosomes and their respective curves is not disturbed by a glance at the animal reactions given below.

	Animal	Date and how inoculated	Date when "tryps" first seen	Date of death	Duration
					Days
1	Guinea-pig II	*G. tachinoides*	(?) May 2	July 25	+85
2	,, IV	Guinea pig II, at death	(?) Sept. 1	Nov. 11	110
3	Rat I ..	Guinea-pig IV, Sept. 1	,, 7	Sept. 14	14
4	,, II ..	Rat I, Sept. 10	,, 16	Oct. 14	35
5	,, III ..	,, II, Sept. 16	,, 21	,, 14	29
6	,, IV ..	,, III, Sept. 21	(?)	Nov. 18	60
7	,, V ..	,, III, Oct. 14	Oct. 27	,, 19	37

Animal Reactions.

These have been done only on a very limited scale. If one may be pardoned for generalizing in the face of this, it may be said the parasite is very fatal to the ordinary laboratory animals. The ease and surety with which these are inoculated is striking and the multiplication of the parasite is rapidly developed. The average length of the life of six rats is thirty-five days, the longest living fifty-nine days, while the shortest life covered fourteen days.

The inoculation period varied from six to thirteen days.

Discussion as to the Identity of the Parasite.

In morphology and animal reactions this strain is so similar to that of Sir David Bruce's Zululand strain that I conclude without fear of criticism to label it undoubtedly *T. brucei*. I fear, however, in doing so I shall run contrary to those observers who claim that the real and original *T. brucei* was not a polymorphic one. I do not wish to enter into the field of contention, but having read his papers, and being present at the discussion following Sir David Bruce's classification of the trypanosomes at the October meeting of the Society of Tropical Medicine and Hygiene, suffice it for me to say that I came away with the impression that the original *T. brucei* was a polymorphic trypanosome. For, though the European laboratory strain of this trypanosome which has been used for so long as a standard of *T. brucei* is at present monomorphic, it has yet to be proved that it has always been so. The curves from this Nigerian *T. brucei* differ somewhat from those given by Ogawa for *T. pecaudi* [4]. Ogawa's figures accord the largest percentage of trypanosomes a length of 25 μ to 26 μ. Now, if absolute reliance is to be placed on curves, one might be lead to the deduction that *T. pecaudi* and *T. brucei* are different. Even if curves and figures were binding, I fear it would be difficult for me to believe and reason that two polymorphic trypanosomes so identical in general morphological details and virulence to animals as *T. pecaudi* and *T. brucei*, one coming from French Dahomey and the other common in Nigeria, are not identical. Moreover, both the curves in this paper and those of Ogawa differ when one compares the figures for the larger and smaller number. Ogawa has shown that the average-sized trypanosomes (25 to 26 μ) occur in larger numbers in those curves constructed from 200 to 300 individuals than in the curves constructed from 1,000 individuals. In my curves the opposite condition maintains, there being a larger number of average-sized trypanosomes (20 to 21 μ) in the curves drawn from 1,000 individuals. Besides, Ogawa's paper refers to a strain of *T. pecaudi* of six years ago, and kept up in the Pasteur Institute during that time. May not the parasite have changed slightly its morphology? To revert to the identity of *T. brucei* (Nigeria) and *T. pecaudi* (Dahomey), it seems likely that these two trypanosomes, morphologically identical and capable of transmission by the same species of glossina, viz., *G. tachinoides* (Bouet and Roubaud have shown that tachinoides does transmit *T. pecaudi* [5]), are one and the same. Moreover, it is not unreasonable to assume that the polymorphic trypanosome found well-nigh throughout Africa, certainly from that part mapped out by Senegal to the Soudan in the north, and British East Africa to German South-West Africa in the south, are one and the same trypanosome. The confusion of the whole subject is regrettable, and it would be kind if the ruling minds would agree to make easy the path of the newcomer and beginner by avoiding unnecessary confusion and retaining for this polymorphic trypano-

some—transmitted in some places by *G. morsitans*, in others by *G. tachinoides* or *G. longipalpis* [6], capable of producing posterior nuclear forms, and which is so virulent to animals—the name *T. brucei*, and thus save him from the brain-racking medley of synonyms as *T. pecaudi* and *T. ugandæ*.

I will conclude with a reference to the contested identity of *T. rhodesiense* and *T. brucei*, and would suggest to the powers that be that in such a country as West Africa, where human trypanosomiasis is not uncommon, and where also *T. brucei* is to be found, that a sufficient number of laboratory animals be kept at each dispensary in the country to allow of every human case being inoculated into these animals. As is well known, those who do not believe in the identity of these two parasites point out (and this must bear some considerable weight) that in West Africa, among other countries, the more virulent Rhodesian strain is absent. This inexpensive scheme may lead to a discovery that some of the more fatal cases of sleeping sickness which have, up to this, for want of proof to the contrary, been put down as due to *T. gambiense*, are really due to what is claimed to be *T. rhodesiense*.

Strain II.—*Trypanosoma nigeriense*. (Scott-Macfie 1913.)

This strain was brought home in two animals, viz., a guinea-pig and a monkey. It was obtained in the following manner. One of the sleeping sickness patients under treatment developed, on the evening of March 24, convulsive seizures which ended fatally in spite of remedies. As a preliminary, eight drachms of cerebrospinal fluid were withdrawn and collected in a measure-glass with the idea of reducing tension. I cannot say this had any marked effect in relieving the convulsions and, as stated, the patient died next morning. The same night the upper four drachms of fluid was injected intra-peritoneally into guinea-pig No. 1, and the remaining fluid was similarly injected next morning into a monkey. Both these animals had been under careful protection and inspection for over two months. Unfortunately, owing to a bout of illness, I was unable to examine these animals till May 3, on which day I found trypanosomes in both. Since that date the animals were examined every three days. Never at any time were parasites at all numerous, and at first it was not unusual for parasites to be absent on two such examining days, *i.e.*, for a period of a week. With this to explain my difficulties I must state that I have nothing new to record. As stated by Macfie, who first named the parasite, it is peculiarly avirulent. The human mortality is under 5 per cent., records of the sleeping sickness camp which, owing to the short time it has been actually in existence are probably not reliable for purposes of deduction, place it round about 3 per cent. It is, moreover, with great difficulty carried on in laboratory animals. Since being brought home three guinea-pigs and a rat were injected from the blood of the original guinea-pig. Blood examination at the time of inoculation showed parasites to be present in the latter. Parasites have not been found in the subinoculated animals up to date of writing. A mouse was injected with the cerebrospinal fluid of the monkey. This also failed.

The parasite on its first appearance is similar to *T. gambiense*, *i.e.*, it has the same long, slender body and a long free flagellum. As stated above, parasites were never found to be numerous so that I can give no curve or other such data.

Since being brought home blood examination of the infected animals has revealed the remarkable, short, stumpy forms described by Macfie which led him to claim for the parasite a specific identity. I have placed these before competent observers who agree that they are relatively more abundant than in any strain of *T. gambiense* they have worked with. One, indeed, said, "Were I asked if this were *T. gambiense*, I feel sure I would say 'No.'"

As stated above, I fear I have recorded nothing here which has added to our knowledge of the parasite. Before closing, however, I would plead that the name *T. nigeriense* be allowed to stand till further investigation shows it to be identical with *T. gambiense*.

Conclusions.

(1) That a polymorphic trypanosome indistinguishable from the Zululand strain of *T. brucei* and very probably, if not actually, identical with it, occurs in the Eket district of Nigeria and is probably to be found in all that country in as likely situations.

(2) That this trypanosome is carried in the natural state by *G. tachinoides* as has been previously shown by Bouet and Roubaud who regarded their trypanosome as *T. pecaudi*.

(3) That the polymorphic trypanosomes *T. brucei* (*T. ugandæ*) and *T. pecaudi*, found in various parts of Africa, are identical, though not naturally always transmitted by the same species of glossina.

(4) That it is desirable that an attempt be made to demonstrate a posterior-nuclear producing trypanosome among the more fatal cases of human sleeping sickness by inoculating every human case into animals.

(5) There is ground for belief that *T. nigeriense* (Scott-Macfie) is not identical with *T. gambiense*, and that further research on this parasite is indicated.

Finally, I should like to take this opportunity of expressing my indebtedness to Dr. Balfour, Director of the Wellcome Bureau of Scientific Research, for placing the laboratories of that institution at my disposal; and also to Dr. C. M. Wenyon, of the above institution, for his help and assistance.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 15, 1914.

FRUITS AND THEIR ACTION.

THE part played by tartaric acid and tartrates in the economy must be of some considerable importance seeing that they are met with in many fruits and their products. Yet the fate of tartaric acid and other tartrates in the body has not been studied with the thoroughness that would seem commensurate with their frequent exhibition in our food, drink, and as medicinal ailments. The grape, of all fruits, is the richest in tartrates where it exists chiefly in the form of the acid tartrate of potassium. From the grape juice in the process of fermentation this salt is gradually eliminated owing to the fact that the acid tartrate, but little soluble in water, is less so in the spirit which is gradually formed during the conversion of the sugar of the grape juice into alcohol. The acid tartrate unites in part with the lime in the grape juice and the two are found lining the vessels or bottles in which wine is kept as crude tartar. These substances are the plague of the wine merchant, the cause of the "bees wing" which necessitates the filtration of port, &c. It is from this crude tartar by crystallization that the potassæ tartras acida of the British Pharmacopœia is obtained and from which tartaric acid and most of the tartrates used in medicine are derived.

In the blood it is not the acid salt that is met with but the carbonate, and it is chiefly as the carbonate that the tartrates are eliminated by the kidney, although when given as tartaric acid a considerable amount of this salt unchanged is excreted by the kidney, showing that tartaric acid given by the mouth is apparently much more difficult of combustion and digestion than are most organic acids.

The fact is that the tartrates are mostly got rid of by the bowel, and only seek exit by the kidney when the bowel is overloaded; yet, curiously enough, grapes in which the acid tartrate of potassium is so plentiful do not serve as a purgative. Bitartrate of potassium is useful in dropsy; it acts as a purgative bringing about watery evacuations owing to the fact that it possesses a low diffusion-power, for this salt is not freely soluble in water, does not cause much, if any, irritation of the mucous membrane, and has little affinity for water in animal textures. It is difficult, therefore, to set forth on what the purgative action of this salt depends. The various ways purgative salts act may be grouped under several headings. The tartrates under consideration would seem capable of preventing the absorption of the secretions of the stomach, liver, pancreas and intestines; that is, the fluid secreted by these viscera remains in the alimentary canal in consequence of the presence of the bitartrate of potassium. The retention of this fluid causes an intestinal flux whereby the system is freed of a plethora of fluid, and, no doubt, of any fermentive agent or toxin which is present. But the deprivation of the system of watery fluid determines its replacement; and in dropsy, whether general or local, fluid is available for that purpose, with the result that the salt is beneficial in Bright's disease, inasmuch as it indirectly lessens the fluid in the tissues and in the cavities of the body be it derived from the abdominal thoracic, or the cerebral regions. Indirectly the blood is benefited, as any poisonous matter present is allowed freer exit owing to the pathways of elimination being cleared, and further riddance of poisonous material facilitated. The kidneys are also relieved, for the purgative action often leads to a copious flow of urine, proving the direct and indirect effects of a salt of the kind in Bright's disease; primarily by clearance of the *prima via*, and secondly by relief of the kidney vessels.

It must be remembered also that fruits do good not only as a means of producing watery evacuations, but also by contributing material to be got rid of.

Orange juices may help to benefit constipation, but the pulp and pith of the orange contributes a quota of vegetable tissue which it is impossible for any organ to digest, and therefore leaves a refuse mass to be got rid of, bringing about a necessary motion. Sucking an orange before breakfast is disappointing to most people seeking relief from chronic constipation, but the efficacy is multiplied tenfold when the pith of the orange is swallowed as well as the juice; the latter helps a watery evacuation, the former by increasing the bulk of the contents of the canal stimulates peristaltic movements, and the two combined will prove efficient provided a sufficient quantity of the fruit is taken; one orange is of little account, but half a dozen seldom fails to bring about relief from constipation. Agar-agar has attained its reputation as a "corrector" of constipation, not from any salts present in its substance, but merely from the bulk it attains in the intestinal canal inducing peristaltic movements. It is the same with all vegetables and most fruits. Grapes fail because of the small amount of vegetable tissue they contain; cabbage, &c., succeeds as its stalk cannot be digested; nuts are taken for the oil they contain, but as a laxative their efficiency depends on the pulp, which when swallowed creates a refuse that necessitates evacuation.

The whole question of purgation by salines is interesting, intricate, and but ill understood. There is the experience of a doctor who after a "fish dinner" consisting of some six or eight courses, spent an uncomfortable night, took a Seidlitz powder next morning, passed four copious watery stools and the fish was *afterwards* vomited.

The trouble is that our knowledge of the physiological processes within the small intestine, more especially, are still obscure, although within the past decade the gain in that direction has been most satisfactory; nor is the pathological chemistry by any means complete, so that still the treatment of fermentive and other lesions is not on a sure basis and therefore more or less empiric. We are not sure to what extent the contents of the canal poison the blood, or whether the blood poisons the contents during the process of secretion. The older physicians almost always commenced their treatment of a case of illness by a purge, which took the form, usually, of mercury or a mercurial salt followed by sulphate of magnesia or soda. Experience, never far wrong in this instance, also bears out scientific teaching; the germicide action of the mercury accompanied its indirect purgative action and then followed a direct purgation by the exhibition of the saline.

Liquid evacuations may be produced by drugs in several ways:—

(*a*) The drug exhibited may attract water directly from the blood into the intestinal canal. With this passage there can no doubt be attracted to (and thereby expelled from the body) dropsical fluids as well as toxins, or possibly germs which may exist in the blood.

(*b*) The glands in the mucous surfaces may be excited to action, and therefore pour into the intestinal canal a large quantity of fluid. It is said that this does not take place when tartrates are used as no albuminous substances are to be found in the fæces.

(*c*) By causing the retention of the water naturally present in the intestine when tartrates as well as such drugs as sulphate of magnesia, potash and soda are given, is considered by many observers to be the true explanation of the passage of liquid stools. How they produce this retention of the fluids met with in the intestine is due to their low diffusion-power, in other words to their very slight tendency to pass from the intestines to the blood. They hold just the water in which they are dissolved, and also that which is met with in the *prima via*, and hurry these along the canal, although not producing much peristalsis as judged by the absence of griping. The fact is, they are mere eliminators of effete watery elements met with in the canal. They do not clear the bowel of solid materials as does castor oil, and they do not aid in the elimination of effete matters from the blood except indirectly.

(*d*) By drugs causing peristalsis the contents of the canal are hurried along, but as these may deal only with the fluid contents always present in the bowel, they may, or may not (probably do not) to any significant degree, relieve the blood of toxins and other deleterious materials.

These and other considerations are of the utmost importance from the clinical point of view. In the Tropics, where fruit is in abundance and ripened to a degree of nicety we can never approach in Northern latitudes, opportunities to study the effects of fruit upon the kidneys and bowel are correspondingly great. To simplify the matter let it be a study of urinary salts to begin with; nothing is more interesting than the microscopic examination of crystals passed, and much information may be gained thereby. We recognize usually three diathesis as determined by the crystalline salts met with in the urine:—the uric acid, the phosphatic and the oxalic. How these are affected by mangoes, persimmons, prickly pears, pine-apples, lychees, &c., we do not know, and are dependent upon popular report often correct although wholly unscientific. We know that rhubarb is unsuited to the oxalic diathesis owing to the excess and size of the oxalate crystals natural to the plant, and beyond that most is vague; strawberries are said to be unsuited to the gouty, but why we know not; tomatoes are condemned in other diathesis, but we are hazy which; and so on through hosts of fruit we, as far as clinical knowledge is concerned, are wholly at sea.

It would be an interesting investigation, and a distinct addition to our knowledge, were a doctor to take up one fruit and work out its behaviour. Some such plan as the following would seem a practical one to commence with. Take, say, three healthy men between 20 and 30 years of age; examine the urine of each man microscopically for crystals daily for a month, excluding the fruit intended to be given and inquired into; then put all the three on the same fruit along with the ordinary diet. Continue the examination daily for some weeks, recording

what is seen by the microscope in the way of crystals. This is not a erudite nor thorough investigation, as every item of diet, both food and drink, ought to be noted, and a chemical examination, both quantitative and qualitative, ought to accompany the microscopic observations; but it is a start in the right direction, and one which is possible for every medical man to carry out, involving but little expenditure of time, and one which does not imply the technical knowledge necessary for chemical research. We hope to hear of some one of our readers who has made observations in this direction. In many parts of the world facilities for work of this kind is possible, and especially we would draw the attention of the medical men in the Philippines and the Straits Settlements to this sphere of study, for in these places the variety of tropical fruits is, perhaps, greater than in any other.

Annotations.

Notes on French Medical Service. — The Paris Academy of Medicine has received from Professor Edward Delorme a report on the condition of the French ambulance and sanitary service. In order to prevent gangrene and tetanus from shrapnel wounds he suggests preventive injections of oxygen, water and antitetanic serum. Dr. A. Dastre gave details of the successful use of a powerful electro-magnet for the extraction of splinters of steel and even of rifle bullets. The use of specially prepared paper underclothing to prevent cold was also advised.

Post-typhoid Cholelithiasis (P. Ballarin, *Gazetta degli Ospedali e delle Cliniche, Milan*, No. 112, pp. 1217-32).—A girl, aged 16, who had typhoid, but the temperature did not return quite to normal for a month after the main typhoid symptoms had subsided. During this convalescent period she had several attacks of gall-stone colic and passed two concrements of pure cholesterin. Typhoid bacilli were cultivated from the centre of each, but none was found in the stools during or after convalescence.

Practical Points in Abdominal Surgery.—Dalziel (*Glas. Med. Journ.*, September, 1914) points out that neuralgias, especially of the twelfth nerve, stimulate visceral lesions. Ventral hernia of extra-peritoneal fat is usually found about 2½ in. above the umbilicus in the median line and is characterized by attacks of vomiting and regurgitation of bile; pain is seldom complained of. In the gall-ducts, stones may grow to considerable size without causing symptoms, especially when the duct becomes dilated. Acute inflammation of the kidney may give rise to symptoms which closely indicate an acute abdominal condition. Hæmaturia may be due to a stone, ulceration, tumour or tubercle of the kidney; also to essential hæmaturia, in which no anatomical lesion can be found, but which, on section, may show thin-walled blood spaces near the apex of the pyramids. Varicose veins of the bladder also give rise to hæmorrhage, as does the presence of bilharzia. Marked abdominal discomfort may be caused by the presence of calcareous glands in the mesentery and the symptoms may closely simulate appendicitis. In making diagnosis of stomach conditions, one must always bear in mind the possibility of spasm of the pylorus and adhesions.

"Traumatic Malacia" following Fractures.—Gaza (*Münch. med. Wochenschr.*, October 13, 1914) studied the phenomena seen in the vertebræ after violence (Kümmell's kyphosis), in the neck of the femur, and especially in the small bones of the wrist and foot. Köhler's disease, a term applied to softening of the scaphoid of the foot after violence, is one of the best known types. The author has seen two cases of so-called traumatic malacia in the semilunar bone of the wrist. In these cases a linear fracture had been in evidence and the presumption was that the softening was a result of fracture. "Köhler's disease" was not originally traced to fracture nor was such a traumatism held responsible for it. Cases of atrophy and softening of certain bones and parts of bones while traceable to violence, have not been connected with latent fractures in all. The author states that in such cases the lesion is a linear fracture accompanied, perhaps, by some crushing of the adjacent trabeculæ or followed by a certain amount of absorption of mineral matter. The skiagrams show a primary macular lacuna clearing up. At a later period more serious deforming alterations occur and such conditions as traumatic coxa vara, Kümmell's kyphosis, and perhaps Köhler's disease. There is often a prolonged period of latency between the primary and secondary alterations, and the joint surfaces may become involved.

Treatment of Tetanus.—W. F. Law (*Brit. Med. Journ.*, November 21) says that wounds of the foot are responsible for by far the greater number of cases in British Guiana, a small wound from a splinter of greenheart being the very frequent history. Sometimes the patient denied any knowledge of injury, and no wound could be discovered, but it can be readily understood that natives who go about barefooted will frequently sustain an injury so trivial as to excite no notice. Cases can be divided into two groups: (*a*) Those with severe febrile disturbance; (*b*) those with slight or no febrile disturbance. In the former—unfortunately by far the most numerous—the temperature quickly ran up to 103° or 104° F. and even higher, and these cases almost invariably proved rapidly fatal. In the latter, the febrile disturbance was slight, up to 101° F., and subsided very rapidly. In these cases the prognosis was more favourable.

Routine treatment, after careful attention to the wound (if any), was to give a very full dose of chloral hydrate and to follow this up with just sufficient of the drug to keep the patient constantly under its influence, and free from spasms. Under this treatment he had quite a fair number of recoveries,

including one case of tetanus neonatorum which was severe at the outset.

The most watchful care is required throughout the whole course of the case: nourishment must be given as freely as possible, and some judgment is needed to give just enough of the chloral and not too much; the more frequent error lies in too small rather than too large dosage.

The Treatment of Enteric Fever. — Broadbent (*Brit. Med. Journ.*, November 21) recommends the use of an ice-bag in the treatment. It should be suspended from a cradle over the right side of the abdomen in the region of the lower part of the ileum. It is important that there should be nothing between the ice-bag and the skin but a piece of gauze or butter muslin, so that the cold may penetrate as far as possible.

Medicinally, there is nothing to equal:—

Quinine sulphate	gr. ij
Dilute sulphuric acid..	ɱiv
Liquor hydrarg. perchlor.	ʒss.

every four hours (not within half an hour of food). If the diarrhœa is excessive the sulphuric acid can be increased, and if there is constipation magnesium sulphate can be added in sufficient quantity to produce one or two actions of the bowels a day. The use of the sulphuric acid and sulphate also tends to diminish the risk of hæmorrhage.

Beddard (*Brit. Med. Journ.*, December 5) in June, 1901, when on the high veldt, had about twenty patients suffering from enteric fever. The camp had been surrounded and attacked the whole day, so that when night fell there was no opportunity for repitching tents, and one had to leave the men, well wrapped in blankets, out in the open. The night was intensely cold; in the morning none were dead, and the most severe cases showed a wonderful improvement, and the whole picture was in striking contrast with that presented by the same men who had previously been treated in army tents. Delirium and restlessness were quieted, temperatures were lower, tongues and mouths were cleaner and moister, only attributable to the good effects of the antipyretic action of the cold air respired by the lungs.

Hydrotherapy has claimed good results; is it not possible that the persistent inhalation of cold air might prove more efficient and safer?

The Pathological Affinities of Beriberi and Scurvy.—S. T. Darling (*Journ. Amer. Med. Assoc.*, October 10, 1914) observed cases of scurvy in South Africa. Not only has the Rand type of scurvy affiliations with beriberi, in that cardiac degeneration and degeneration of the vagus occur in typical scurvy as well as in beriberi, and by reason of the appearance of beriberi or neuritic features in certain epidemics of scurvy, but many of the negro miners dying of various diseases, at necropsy disclose slightly œdematous calves without any other sign of scurvy or beriberi. Scurvy has definite affiliations with rickets, and infantile scurvy, too, for in a case seen there had been extensive destruction of the chrondrocostal junction, with depression of the entire sternum. Three severe cases of scurvy, practically free from complication (one had a little tuberculosis), came to necropsy at hospital. The anatomical findings were closely similar and are summarized in a composite anatomical diagnosis; hæmorrhagic extravasation into muscles of both legs, left forearm, and left psoas muscles, involving the muscle fascia between muscles, old and recent; subperiosteal hæmorrhage, shaft of left femur; hæmorrhage into left knee-joint; old subcapsular hæmorrhage (knee-joint); ulcerative gingivitis with hæmorrhages; separation of mandibular periosteum; anæmia of all viscera; hyperplasia of femur marrow; œdema of lungs, and scaly desquamation of both legs; hypertrophy and dilatation of right heart; fatty degeneration of musculature of right heart; the right ventricular wall is definitely thickened, of a yellowish colour, and does not collapse as in the normal heart (this lesion is pathognomonic of Rand scurvy and brings it into relation with beriberi).

Conclusions.—The striking eccentric hypertrophy and dilatation of the right heart with extensive fatty degeneration of the same musculature, the left heart remaining apparently normal, and the severe degeneration of the vagus nerve described in several fatal cases of scurvy from the Rand, furnish new and additional facts which show the intimate relationship between scurvy and beriberi as to etiology. The presence of affinities between these two diseases (scurvy and beriberi) and certain other cachexias lends emphasis to the opinion that they are one and all the result of the continued use of a one-sided and deficient diet.

Malnutrition in Adults.—C. Funck (*Archiv fur Verdauungs-Krankheiten*, Berlin, xx, No. 4, pp. 423-542) considers the trouble is due to the improperly prepared molecule acting like a poison, setting up a kind of anaphylaxis. Patients showed a toxic relative lymphocytosis. The anaphylaxis condition may entail disturbance in carbohydrate metabolism, and this disturbance may persist even after the primary cause, the malnutrition, has ceased to act. This all paves the way for diabetes and other metabolic diseases. The improperly prepared alien albumin may get into the blood from the food or from the pathological product of some gland with an internal secretion—often as a response to the stimulus from food entering the bowel. Correction of one may have a favourable influence on the other. When diabetes is complicated with gastro-enteritis, the sugar output may often be reduced to normal merely by curing the stomach and bowel trouble. As the gastro-intestinal mucosa becomes less permeable for the alien albumin, and its normal functions are restored, the functioning of glands with an internal secretion, the pancreas in particular, improves with it.

Normal conditions are obtained by modifying the diet, lavage of the stomach, supplying substitutes for lacking digestive ferments, and having the patient drink large amounts of a mineral water. But far

beyond the effect of these measures is systematic flushing out of the bowel with a hypotonic solution through a duodenal sound. This clears out the bowel, draws out toxic secretions and washes them away, modifies the bacterial flora and its culture media in the intestines, while exerting a healing action on the mucosa and glands in the bowel. He uses three litres in from two to five hours, or keeps up the irrigation for sixty hours. In some cases of impending uræmia he rinsed the bowel first with a hypotonic solution without chlorides, and followed this with an isotonic diuretic solution, keeping up this enteral drainage for six hours. The blood-pressure subsided to 35 mm., and profuse diuresis followed. Similar prompt and far-reaching benefit was realized in delayed reabsorption of effusion and transudates, in anæmia, in "presclerosis," and to promote the elimination of the products of acute infection. In a case of "asystolic toxemia" the pulse was reduced by this enteral drainage from 112 to 84, the respiration rate from 26 to 18, while the output of urine increased from 950 to 1,750 c.c. in thirty-six hours.

The clinical manifestations of this form of chronic malnutrition may include dyspepsia in its broadest sense, pruritus, eczema, neurasthenia or neuralgia, constipation generally of the spastic type, diarrhœa with all the signs of an enteritis, subjaundiced, greyish tint, depression, migraine or hypertony. Examination of the stools throws no light on the absorption of toxins, but there may be anacidity and defective pancreas function and motor insufficiency of the stomach.

Differential Skin Reaction in Variola and Varicella. — Tièche (*Berlin. klin. Wochenschr.*, September 28) by a test technique, similar to that of Pirquet's tuberculin skin reaction, differentiates small-pox from varicella and other eruptive diseases. This simple measure is harmless and reliable. With protective vaccination against varicella when an epidemic broke out in an institution with 200 children, no local reaction was observed until the eighth day at the point inoculated with the varicella lymph. Vaccine lymph, on the other hand, always induces a prompt local reaction, and generally in four hours. Tièche experimented until he had conclusively demonstrated that no local reaction was evident for several days, if at all, after vaccination in the arm with the secretion or rubbed-up contents of a varicella pimple. On the other hand, the secretion or scrap of contents from a small-pox pustule promptly induces a typical early reaction in the skin at the point of inoculation. He reports constantly negative results in eighteen varicella cases, and constantly positive in nine variola cases. With seven new cases suspected to be small-pox, the reaction was positive in five, and the course of the cases confirmed the assumption of variola, while the negative reaction in the other cases likewise was proved correct by the further course. The test inoculations were made on three healthy adults, himself, his wife and sister-in-law.

To render the secretions harmless, the lymph is heated to 60° or 70° C. for five minutes before applying it to three minute scratches on the arm. Variola lymph, after keeping for eleven months, gave a positive reaction in one case. A few cases are described in which everything seemed to indicate small-pox but this negative local reaction, and on this he based his diagnosis. One patient stayed at his hotel, thus saving all concerned great annoyance and trouble, and the course of the case confirmed that it was not small-pox, but either varicella or an atypical erythema multiforme. Public health officials might be tested with varicella secretions to learn whether they are especially sensitive to it.

Actinomycosis.—Dressl (*Deutsch. med. Wochenschr.*, October 15, 1914) considers this disease to be due to a trichomyces known as the actinomyces, this anaerobe being often associated with streptothrix. In clinically similar cases there may be only virulent streptothrix. In recent genuine cases of actinomycosis the pus may contain no granules; these cases require culture test for differentiation. Granules visible to the naked eye consist of felted streptothrix.

Notes and News.

A HARDY ANNUAL.

"WELLCOME" Photographic Exposure Record and Diary (for 1915) is again with us. To photographers, both professional and amateur, the Record has for years proved an essential volume, for with it they are equipped in a measure wellnigh impossible to attain by other means. It is a veritable encyclopædia of photography, condensing as it does within one pocket-sized volume clear, simple directions for all possible purposes. A prominent feature of the volume is the "Wellcome" Exposure Calculator, the ingenious device which, by one turn of one scale gives the correct exposure for any plate or film at any time of day or year. The Exposure Record and Diary are suitable for any part of the world; a truly valuable shilling's-worth.

TEFF, A VALUABLE TROPICAL AND SUB-TROPICAL HAY CROP.

TEFF (*Eragrostis abyssinica*) is an annual hay grass, particularly suitable for use as a summer catch-crop, and a smother-crop for weeds, owing to its rapid growth when weather conditions are at all favourable. If sown with the early spring rains it has been possible to cut three crops of hay in the season, giving 2½ to 3 tons per acre, and to obtain autumn grazing from the aftermath. The introduction of teff grass into South Africa has raised many small farmers struggling for a living to positions of comparative comfort and independence. They are unanimously agreed that this introduction alone has repaid over and over again the whole cost of the Division of Botany of the Department of Agriculture from its inception to date.

Colonial Medical Reports.—No. 25.—Southern Nigeria.

MEDICAL REPORT FOR THE YEAR 1910.

By H. STRACHAN.

Principal Medical Officer.

During the year 85,237 sick persons were treated in the three Provinces. Western Province, 34,143; Central Province, 25,040; Eastern Province, 26,054. Total, 85,237.

The principal diseases treated were: Malaria, 7,052; dysentery, 1,421; intestinal disease (chiefly diarrhœa), 8,710; rheumatism, 7,362; respiratory, 9,020; diseases of the skin, 2,899; parasitic, 7,723; filariasis, 39; injuries, 12,398.

Small-pox and Vaccination.

The satisfactory condition of Lagos Town as regards small-pox continued during 1910; only 17 cases were admitted into the Infectious Disease Hospital, all of which were infected outside Lagos.

The usual epidemic outbreaks occurred in various parts of the Provinces, and many cases came over the border from Dahomey in the latter half of the year.

The influence of the Priesthood of the Small-pox God had its usual baneful effect, but during the year power to deal with these monsters was given by law.

At Calabar no case of small-pox occurred in the town, but in the other districts of the Province 36 cases of small-pox were treated.

At Bende, Aro-Chuku and Ahoada, epidemics of small-pox occurred and were properly and satisfactorily dealt with.

In the Central Province 115 cases of small-pox were treated.

The following figures show the total number vaccinated and the number of "successfuls."

	Total vaccinated	Successful
Western Province ...	75,691 ...	43,981
Central ,, ...	12,902 ...	6,935
Eastern ,, ...	47,054 ...	37,663
	135,647	88,579

There was an increase of 13,780 in the total number of persons vaccinated; and an increase of 12,215 in the total number of successful cases.

In the Western Province there has been a decrease in the number vaccinated in Lagos Town and a few of the other larger centres, due to some extent to the diminishing number needing the operation.

In the Eastern and Central Provinces there has been an increase in the number; but in all the Provinces a vast number of persons still escape vaccination.

The percentage of successfuls for the three Provinces was 65·3.

Considering the opposition to vaccination on the part of the majority of the natives, and the effect of the power wielded by the Priesthood of the Small-pox God, the results are, as a whole, encouraging.

Sanitation.

Central and Eastern Provinces.

Sanitation has been carried on as previously, and much good work done during the year.

The Plague scare in 1908, and the Yellow Fever scare in 1910, led to extra exertion on the part of the natives in Lagos and other large towns, the results of which, in regard to cleanliness of compounds, have been maintained.

In Lagos, Calabar, Opobo, and Bonny considerable areas of swampy land were reclaimed.

The Sanitary Branch of the Medical Department was formed in March, and a senior and junior sanitary officer appointed in July; much is hoped in the cause of sanitation in West Africa from this action.

Dr. Connal, who made special study of the mosquitoes in Lagos, has reported that the chief mosquitoes found are *Pyretophorus costalis* and *Stegomyia fasciata* (the latter found in the houses in the day, and the former in evenings, nights, and early mornings).

In the water pots of the natives were found larvæ of *Stegomyia fasciata*, *Culex tigripes*, var. *fusca*, *C. duttoni*, *C. dissimilis*, and others.

Adult stegomyiæ were found to be more common about a week after a shower of rain. They come from regions outside the town limits, and seem to replenish the stock exhausted by the warfare waged in the town itself.

The mosquito index, when anti-mosquito work was started several years ago, was cent. per cent. When Dr. Pickels, the Senior Sanitary Officer, made his summary, early in August, we found it 47 per cent.; at the end of December it was 15 per cent.

Though, no doubt, this fall was in part due to the usual effect of the dry season—and we must expect a rise when the rains return—it is certain that much was due to the greatly increased work that was rendered possible by the grant of £110 per month for that special object, and it is clear that there should not be the slightest relaxation of this most important work.

Water Supply.—The work in the Iju Valley, to provide a water supply for Lagos Town, was begun during the year.

The following anti-malarial work has been continued:—

Swamp reclamation; the regular use of quinine as a prophylaxis among Europeans; destruction of mosquito breeding places by oiling of such water collections as cannot be drained; use of mosquito nets, use of wire gauze for rooms and houses, use of quinine prophylaxis among such natives as are willing to take the drugs, and teaching and advice to all.

The quantity and cost of the quinine issued gratuitously during the year in the three provinces was as follows:—

	£	s.	d.	
Western Province for prophylaxis	208	0	8 ...	1,206,000 grains
,, ,, ,, fever	157	11	3 ...	916,300 ,,
Eastern ,, ,, prophylaxis	39	6	0½	275,671 ,,
,, ,,	21	5	9 ...	to natives (125,000 grains to Europeans)
Central Province for prophylaxis	28	7	9 ...	140,532 grains

Yellow Fever.

There was an outbreak of yellow fever in May on the Gold Coast and Sierra Leone.

Special precautions were immediately taken in Lagos.

In Forçades, Calabar, and other Southern Nigeria ports quarantine stations were put in good order; increase in number of mosquito gangs and of sanitary inspectors was sanctioned.

Placards were posted and leaflets distributed in English and the vernacular, in which the nature of the disease and the method of combating yellow fever by attacking the stegomyia were clearly and simply explained in the three Provinces, and lectures were delivered to the people on the same subjects in various centres.

Statistics.

In the Lagos Hospital 1,364 natives and 167 European patients were treated as in-patients, as compared with 1,519 natives and 122 Europeans in 1909.

The death-rate of Europeans admitted was 3·5 per cent. (six deaths)—6,479 native out-patients were treated as compared with 5,179 in 1909.

Three hundred and thirty-four major surgical operations were performed.

The following gives the total number of patients treated in the dispensaries of Lagos Town and Ebute-Metta: Massey Street Dispensary, 4,250; Ereko Dispensary, 7,758; Ebute-Metta, 5,807; total, 17,185.

The two former are in charge of native medical officers.

In the European ward, Ibadan Hospital, eighty-nine patients were treated as in-patients, with no deaths.

In the native ward 172 patients were treated, with fifteen deaths.

In the out-patients' department 2,597 patients were treated.

There was a diminution in the number of native out-patients, but an increase in the number of European cases.

In the Ibadan Dispensary 2,831 native patients were treated, including three European patients.

At the Badagry Hospital twenty-two Europeans were treated as out-patients, forty-five natives as in-patients, and 1,116 out-patients.

At Epe Hospital ninety-five in-patients and 1,166 out-patients, natives, were treated.

There were twenty-four European out-patient cases.

The number of natives in Southern Nigeria who have received medical aid at the public expense during the year is as follows: Western Province, 27,331; Central Province, 19,743; Eastern Province, 22,515.

At the Calabar European Hospital 139 patients were treated (of these eighty-two suffered from malarial fever, twenty-one official and sixty-one non-official).

In the native hospital, Calabar, 1,114 natives were treated as in-patients and 5,490 were treated in the out-patients' department; 119 surgical operations were performed.

The Calabar prison dispensary: In-patients, 253; out-patients, 200.

In the New Barrack Dispensary 1,564 patients were treated, of whom fourteen were Europeans.

At Opobo European Hospital only one in-patient was treated.

At the European Hospital at Warri fifty-one patients were treated.

At Onitsha European Hospital forty-one in-patients (fourteen officials and twenty-seven non-officials) were treated, with five deaths.

In the native hospital, Onitsha, 369 natives were treated and 4,550 out-patients, with forty-three deaths.

Three officials were invalided during the year in the Western Province, five in the Eastern Province, and ten in the Central Province.

In the Onitsha Leper Asylum seventy-five cases were treated, with six deaths.

In the Yaba Leper Asylum seventeen cases were treated, with one death.

Treatment with nastin is under investigation: it is far too early yet to pronounce any opinion on it.

In the Lunatic Asylum at Calabar twenty-six patients were treated, with three recoveries and two deaths.

During the year 529 cases of guinea worm were treated in Southern Nigeria, viz.: 312 in the Western Province and 217 in the Eastern and Central Provinces.

A case of sleeping sickness occurred in the Western Province, that of a little girl infected at Fernando Po. The case is still under treatment, but will be fully reported on at its close.

Thirty-nine cases were treated in the whole Colony, thirty-three in the Eastern Province, five in the Central Province, and one in the Western Province.

Colonial Medical Reports.—No. 26.—British Honduras.

MEDICAL REPORT FOR THE YEAR 1911.

By J. H. HUGH HARRISON.

Colonial Surgeon.

STATISTICS.

Hospital.

REMAINING at beginning of 1910, 51; admitted during the year, 648; total, 699.

Discharged: Cured, 436; relieved, 57; not relieved, 25; died, 90; remaining December 31, 40; total, 648.

Operations, average per week, 4; out-patients, daily average, 2·3.

By the above figures it will be seen that the work of this institution was extremely satisfactory, the admissions being seventy in excess of last year. Since June, Dr. Mackey has been resident at the Hospital, a fact by which a great deal of work has been got through. Lectures were held twice a week for nurses and an examination came off at the end of the year.

It is hoped that a proper operating room will be provided; at present it is impossible to carry out operations in a proper aseptic manner; while the lighting of the theatre is very faulty.

Lunatic Asylum.

The following is the statistical record for the year:—

Remaining on January 1, 1910 ...	59	
Admitted during 1910	13	
	—	72
Discharged during 1910	4	
Died during 1910	5	
	—	9
Remaining on December 31, 1910 ...		63

One death occurred from phthisis and recently this year three others have occurred. This is not very satisfactory owing to the overcrowding, but every precaution is taken to KEEP such patients isolated.

Poor House.

Number of inmates remaining on January 1, 1910:—

Males	16	
Females	9	
	25	
Admitted in 1910	15	
	—	40
Discharged in 1910	4	
Died in 1910	5	
	—	9
Remaining on December 31, 1910 ...		31

QUARANTINE.

Vessels boarded: Ships of war, 4; steamships, 349; schooners, 160; motors, 37; yawls, 49; sloops, 175; doreys, 164; barges, 2; total, 940.

Number of vessels fumigated, 231; number of crew and labourers inspected, 18,955; number of passengers inspected, 4,697. Amount of deposits collected during 1910: U.S. and B.H. currency, $3,603.00; Sols, $1,866.00.

Every vigilance is exercised in the matter of admitting people from the surrounding Republics, especially Honduras, where an outbreak of yellow fever occurred on board the U.S.S. "Marietta." One death and five cases. Further, owing to the influx of a great number of troops at the northern ports, such as Puerto Cortez, La Ceiba, Truxillo, &c., the sanitary conditions cannot have improved.

GENERAL HEALTH OF THE COLONY.

Measles seems to have been prevalent in all the districts, otherwise no infectious diseases occurred. The infant mortality in the Colony stands extremely high.

Corosal.—Out of a death-rate of 140, 64 were children between the ages of 1-5 years.

Orange Walk.—Out of 157 deaths, 69, or 43 per cent., occurred in children under 5 years of age.

Stann Creek.—Out of 158 deaths, 86 occurred in children 5 years old and under, over 54 per cent.

Cayo.—Out of 89 deaths, 42 occurred in children 5 years old and under.

Toledo.—Out of 161 deaths, 59 occurred in children 5 years old and under.

Return of the principal causes of deaths in the Colony: Malarial fever, 226; dysentery, 46; phthisis, 59; diseases of nervous system, 44; diseases of circulatory system, 47; diseases of respiratory system, 115; diseases of digestive system, 127; diseases of urinary system, 31; other causes, 357; total, 1,052.

Lectures in tropical and personal hygiene were given during the year to the teachers and pupil teachers of the schools of the different denominations. The syllabus consisted of elementary anatomy and physiology, and the attendance was fairly good. Those who went up for examination did fairly well.

Since then I have had a communication from the Women's Imperial Health Association of Great Britain wishing us to co-operate with them in order to further their good work; I have taken up the matter seriously and hope that with the assistance of the intelligent ladies of the town to do much

Return of Diseases and Deaths in 1910 in the Belize Hospital,

British Honduras.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	2	—	2
Anæmia	5	—	5
Anthrax	—	—	—
Beriberi	2	—	2
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	18	3	18
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	6	1	6
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	27	—	28
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	1	—	1
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	25	—	25
Quartan	1	—	1
Irregular	—	—	—
Type undiagnosed	30	—	30
(*b*) Remittent	10	—	10
(*c*) Pernicious	2	—	2
(*d*) Malarial Cachexia	18	1	19
Malta Fever	—	—	—
Measles	12	1	12
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	5	1	6
Old Age	—	—	—
Other Diseases	82	7	82
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	16	—	16
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	15	2	16
(*a*) Primary	—	—	—
(*b*) Secondary	—	—	—
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Te tanus	—	—	—
Try panosome Fever	—	—	—
Tubercle—	52	23	55
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

General Diseases—*continued.*	Admissions	Deaths	Total Cases Treated
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	2	—	2
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	8	—	8
Circulatory System	16	7	16
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	—	—	—
(*a*) Diarrhœa	32	7	32
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	1	—	1
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	1	—	1
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	5	1	5
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	50	5	51
Ear	1	—	1
Eye	4	—	4
Generative System—	—	—	—
Male Organs	6	—	6
Female Organs	17	—	17
Lymphatic System	4	—	4
Mental Diseases	—	—	—
Nervous System	25	6	26
Nose	—	—	—
Organs of Locomotion	8	—	8
Respiratory System	18	4	19
Skin—	15	—	15
(*a*) Scabies	6	—	6
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	40	16	39
Injuries, General, Local—	54	2	54
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	2	—	2
Ascaris lumbricoides	2	—	2
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

good, especially in the direction of the rapid spread of tuberculosis and our terrible infant mortality.

Corosal.

The health of this place has been fairly good. Dysentery still seems to be fairly prevalent, twenty-six deaths having occurred from that cause. The death-rate has been rather higher than the previous two years.

Belize District.

I tried to take the opinions of the general practitioners in the town as to which they considered the sickliest season of the year, because it was popularly believed that July and August were the worst months, but opinions of the medical men do not prove this to be the case. Dr. Gahne thinks that the sickliest season is during the heavy rains, accompanied by land winds. Dr. Davis thinks that October and November are the most unhealthy in Belize. Dr. Heusner thinks October, November, and December. All seem to concur that the land winds are prejudicial. From our hospital records it is difficult to make any definite statement on this point. The highest in hospital under treatment was in June, and, strange to say, the lowest numbers were in August and December.

INSPECTION.

The work of the inspectors of nuisances was not satisfactory. I had to bring this to the attention of the Government, after which the Screening Ordinance was better carried out. The following notices were issued for defective or unscreened water receptacles:—

Vats, 337; tanks, 60; barrels, 1,251; total, 1,648.

Only six summonses were issued. The people are very difficult to deal with, but this can be remedied by an honest and searching inspection by the inspectors, otherwise such work is useless and a danger to the town.

VACCINATIONS.

Belize District, 164; Corosal District, 207; Orange Walk District, 288; Stann Creek District, 70; Toledo District, 58; Cayo District, 45; total, 832.

The above figures show that vaccination is satisfactorily carried out.

Colonial Medical Reports.—No. 27.—Sierra Leone.

MEDICAL REPORT FOR THE YEAR 1910.

By R. M. FORDE.

Principal Medical Officer.

THE COLONY.

The approximate population of the Colony was 75,051. The deaths registered numbered 1,550 and the births 1,152, showing a death-rate of 20 per 1,000 and a birth-rate of 15 per 1,000. Registration, however, is not compulsory, and these figures cannot be taken as reliable.

In Freetown registration of births and deaths is compulsory, and therefore more reliable. From the Census returns of 1911 it is shown that the population of the town has decreased by 489, so that it must be concluded that the estimated population for 1909 was too high, and this fact, combined with the undoubted greater amount of illness, accounts for the marked difference in the death-rate for 1910.

The population for Freetown, calculated on the recent Census returns, was 34,010.

The births registered numbered 581, and the number of deaths was 936; these give a birth-rate of 17 per 1,000, and a death-rate of 27 per 1,000 of the population.

The chief causes of death were as follows: Malarial fevers, 122; nervous system, 156; respiratory system, 117; digestive system, 190; circulatory system, 52; genito-urinary, 23; debility, 80; premature births, 48; tubercle, 24; unclassified, 42.

There were 10 deaths from yellow fever, viz., 5 Europeans, 3 Syrians, 2 natives, as well as several suspicious cases that recovered. The first case occurred early in May and the last on September 22. Fumigation of houses, screening of patients in mosquito-proof cases, and rigorous measures directed against the propagation of stegomyia were carried out from the beginning and with success, under the able direction of Dr. Kennan, who was at the time Acting Principal Medical Officer.

Of the total deaths registered 214 occurred under the age of one year, which gives an infantile death-rate of 368 per 1,000 births, a rise of 24 on that for the previous year.

The infantile death-rate for the past nine years was as follows:—

Year 1902, 466; 1903, 471; 1904, 388; 1905, 461; 1906, 434; 1907, 357; 1908, 351; 1909, 344; 1910, 368.

Health of European Residents.

The health of Europeans was not so satisfactory as in 1909, the death- and sick-rates being decidedly higher. An outbreak of yellow fever in Freetown was the chief cause of this. Blackwater fever was also unusually prevalent, there being nine cases treated at the Nursing Home, with one death.

The total number of Europeans resident in the Colony and Protectorate during the year was 831.

There were 15 deaths among these, 13 in Freetown, and 2 in the Protectorate. These were due to the following causes: Yellow fever, 5; blackwater fever, 4; pernicious malarial remittent (hyperpyrexia), 1; dysentery, 1; drowning, 1; septicæmia (wounds caused by buffalo), 1; heart disease, 1; debility, 1.

Official Sick-rate.

The total official strength for the year was: Europeans, 171; natives, 946; total, 1,117.

Among the former there were 83 admissions on the sick list with 2 deaths, and among the latter there were 589 admissions with 10 deaths.

Vaccination.—This was carried on fairly regularly during the year throughout the Colony and Protectorate, but not with quite the same success as in the previous year.

Small-pox.—The Colony and Protectorate remained free from any epidemic outbreak of this disease during the year. Sporadic cases, however, occurred at Bo, York and Freetown. In all only four cases were reported.

Quarantine.—During the year the quarantine station was opened once for the isolation of persons landed from suspected ships arriving from Sekondi during the yellow fever outbreak at that place. Fifty-one persons were isolated at the station during the period it was open, and no cases of illness occurred amongst them.

Yellow Fever.—An outbreak of this disease occurred. The first case came under observation in May and the last case in September. There were in all 13 diagnosed cases with 10 deaths, and 11 suspicious cases with one death.

The nationality of the patients is shown here:—

	Diagnosed Cases		Suspicious Cases	
	Deaths	Recoveries	Deaths	Recoveries
European	5	3	*Nil*	8
Native	3	*Nil*	,,	*Nil*
Syrian	2	,,	1	1

It is quite possible that other cases occurred among the native population, but such cases not having come under medical observation no record of them was possible. I am of opinion that this disease is of rare occurrence in epidemic form in the Protectorate.

Sleeping Sickness.—Though medical officers have been on the special watch for this disease only one diagnosed case and three suspicious cases were reported from the Protectorate and three suspicious cases in the Colony. From the reports of medical officers I am inclined to think that human trypanosomiasis is at least not on the increase in Sierra Leone. Regulations for checking the introduction of the disease by shipping have recently been brought into force.

Leprosy.—From the observations of the medical officers this seems to be most prevalent in the Karene and Kaballa districts, in both of which several cases were met with during patrols. In every instance advice was given as to the necessity for segregation, which the chiefs promised to follow.

Goitre.—This condition is also reported as being fairly common in certain localities in the Karene and Kaballa districts, several cases being met with during the sanitary patrols of the medical officers.

Syphilis.—This disease is met with throughout the country, but from the comparatively small number of cases that come up for treatment I am not in a position to say that it is prevalent to any alarming extent.

Three hundred and seventy-one cases were treated in the various hospitals and dispensaries, chiefly of the tertiary variety.

Beriberi.—Several outbreaks of beriberi occurred during the year, and the following number of cases came under treatment at the different places:—

Colonial Hospital, Freetown, 27; Kennema Prison, 7; Daru Barracks (W.A.F.F.), 10.

In each case the incidence of the disease was put down to the use of imported (Indian) rice. Owing to the great scarcity of native rice during a part of the year (May to September), large quantities of rice, chiefly Indian, had to be imported, and it is a notable fact that where this rice was freely used by the people beriberi symptoms became prevalent, though beriberi is not, under normal conditions, often met with here.

It is also remarkable, as mentioned by Dr. Davson, that in the gaol, where there was very little imported rice used, there were no cases of the disease. These facts tend to the conclusion that the imported rice contained the germ or poison of beriberi, though to ordinary inspection it appeared to be of good quality.

Sanitation in Freetown.

The sanitation of Freetown was, as usual, under the management of the Sanitary Department of the City Council, to which body the Principal Medical Officer is Medical Officer of Health. During the first half of the year there were only 50 labourers employed for scavenging duties, but later on, owing to the presence of yellow fever, it was thought advisable to increase the number to 200, and this was done at the expense of the Government, as vigorous anti-stegomyia measures were considered necessary. A large proportion of the refuse gathered in the town had to be removed by manual labour, owing to the insufficient number of carts employed, viz., two bullock carts and one mule cart. This is a serious defect in the important work of scavenging in a large tropical town. Some difficulty having arisen in the disposal of tin and bottle rubbish by burial, as was formerly the practice, owing to the rocky nature of the remaining available sites around the town, two canoes were provided by the Government for the disposal by dumping in the sea of all such refuse, and this method has proved a great success.

It is intended to have receptacles of expanded metal of suitable form placed in the streets for the collection of old tins and bottles, &c. The new

Fish Market was opened during the year; it affords a more sanitary method for the disposal of fish by sale than the former system of exposing for sale this universal article of food in any vacant bit of road or footpath in the town. The drawing up of a comprehensive plan for the reconstruction of the drains and streets of Freetown is under consideration, but this will not be allowed to interfere with the carrying out of the minor sanitary improvements in drainage, &c., of the town that are at present considered of urgent importance, and which will to a large extent assist in the mosquito extermination campaign now being fought.

Anti-malarial Measures.—These were followed out as usual during the year, and consisted of the following:—

The collection of all waste tins and bottles and other rubbish likely to act as mosquito breeding grounds, and their disposal by dumping in the sea at a suitable distance from the shore, two canoes being provided for this purpose.

The periodical oiling of stagnant pools.

Regular attention to the various watercourses, to keep their channels free from obstructions, so as to prevent the formation of stagnant pools in them.

House-to-house inspection of premises for the detection of mosquito larvæ in water receptacles. This necessary work was placed on a satisfactory footing by the appointment in October of a Junior Sanitary Officer, who carried out strict larvæ inspections under the Public Health Amendment Ordinance No. 16, of 1910, by which the presence of larvæ in any water vessel in a compound renders the occupier liable to be dealt with summarily, whether a notice has been served to abate the nuisance or not.

A new Public Health Amendment Ordinance, dealing specially with the presence of mosquito larvæ in premises, came into force on September 30, 1910. Under this Ordinance there were forty-two persons convicted for having larvæ in water receptacles on their premises. Under the Principal Ordinance (Public Health) there were twenty-seven convictions for defective mosquito-proof covers to barrels.

In reference to the removal of tin and bottle refuse, there were 1,021 canoe loads removed from the town and disposed of by dumping in the sea, the capacity of the canoes by measurement being two tons. This represents 2,042 tons of this variety of rubbish disposed of during the year.

There are two important points in connection with the sanitation of Freetown which I consider require special and early attention, particularly as they are intimately connected with mosquito extermination measures:—

(*a*) *Improving the Water Supply.*—The water supply at Freetown is at present only just sufficient to meet the ordinary requirements during the dry season. The only reservoir is capable of storing only two days' supply, so that in the dry season there is no provision to meet an emergency such as the bursting of a main, or, more serious still, the development of leaks due to cracks in the reservoir itself. Where an unlimited quantity of water could be collected in the rainy season, I am of opinion that such an unsatisfactory condition of things as an insufficient water supply in a large tropical town like Freetown, with all its attendant insanitary evils, should be remedied at the earliest opportunity. This defect in the public water supply bears a close relation to the question of stegomyia extermination, the importance of which has lately been vividly impressed upon us by an outbreak of yellow fever in the town, as it means the continuance of the presence of wells and of an insufficient number of public stand-pipes around the town, which in its turn means the keeping of water receptacles by householders. These receptacles, barrels, French jars, drums, tins, &c., have been proved to be the chief source of mosquito larvæ at the present time, resulting in numerous summonses under the new "larvæ" Ordinance, though the Government has arranged to assist the public by the supply of taps and mosquito-proof covers at cost price (4s. 7d. to those who can pay, but free to the poor).

(*b*) *Concreting and Canalizing of the Watercourses.*—There are three large streams running through the town, viz., the George River, Sanders Brook, and Nicol Brook, with two or three less important ones; these have very irregular courses, and run in small ravines varying from a few feet up to 10 ft. or 15 ft. deep. The sides and floors of these ravines or natural channels are extremely jagged and uneven, the floor or bed consisting chiefly of large boulders and loose stones of varying sizes. In the rainy season these watercourses are frequently and thoroughly flushed from side to side by the rush of water down the mountain sides, every pool and crevice being scoured out; but in the dry season, when the flow of flood water, owing to the absence of heavy rain, falls to a negligible quantity, the total amount of water flowing in them becomes reduced to a mere trickle, and the numerous culde-sacs formed by the boulders and stones become so many stagnant pools wherein mosquitoes breed. This is another source of mosquito breeding grounds that could and should be got rid of. The only efficient method of doing this would be, in my opinion, by a thorough scheme of concreting (with a central channel) of the bed of each stream within the city boundaries.

It is only during the last two months of the dry season that there is any actual shortage of water, but at that time it must be remembered that the present supply can only be considered a "hand to mouth supply."

If an accident happened to either the service reservoir or mains the city would be without water, as there is no storage to fall back upon.

A storage reservoir or reservoirs capable of containing singly or jointly about 30,000,000 gallons should form part of the scheme. The exact requisite volume of storage cannot be determined at present, but it is probable that the above-mentioned size would be ample. Without some storage it is impossible to predict the extent to which the dry

weather flow, and consequently the supply, may dwindle down during droughts. If, therefore, there were no storage, interruptions to the supply might occur, involving the most serious inconvenience, and danger to health would be the result.

The Teaching of Hygiene.

This subject is now being regularly taught in the secondary schools, and at the annual examination in December the results obtained were as follows:—

Of the 107 candidates who sat for examination

2	obtained	between	60	and	70	per	cent.
9	,,	,,	50	,,	60	,,	
15	,,	,,	40	,,	50	,,	
17	,,	,,	30	,,	40	,,	
23	,,	,,	20	,,	30	,,	
37	,,	,,	10	,,	20	,,	
4	,,	under 10 per cent.					

Mr. Nicholas Taylor, of the Church Missionary Grammar School, obtained the first prize, £5, and the seven next best candidates received £2 each.

There were seven more candidates than the previous year. The five schools received a bonus of £20 each.

Hill Station.

The health conditions of Hill Station have during 1910 continued to be quite satisfactory. There were during the year 79 residents, an increase of 25 over that for the previous year. With this large addition to the number of residents it is gratifying to note that there was an increase of only two in the number of admissions on the sick list.

The total number of cases on the sick list was 18. Of these 6 were due to climatic causes: Malarial fever, 5; yellow fever (suspected), 1.

In three of the cases of malarial fever, infection was contracted during visits to out-stations in the Protectorate. Two of the cases occurred in the military residents who worked in Freetown daily. The suspected case of yellow fever occurred in a newly arrived official who frequently had to remain in his office overtime, owing to extra work, and was not, in consequence, able to leave Freetown until late in the afternoon.

The military residents almost equalled the officials. This is due to the fact that bungalows vacated by officials going on leave are immediately rented to military men, who are always keen to take advantage of the pleasant climate of Hill Station with its convenient mountain railway.

This renting of the official quarters at Hill Station is being overdone, and this was especially so during the past year, when several Government officers were compelled to reside in the Rest House in Freetown for prolonged periods, great personal inconvenience and discontent being caused thereby, while several bungalows were at the same time occupied by temporary tenants. Rest houses are not intended to be used as quarters, and it is unreasonable to expect an officer to carry on his duties satisfactorily under such unsettled and disturbing conditions.

Owing to the increase in the European staff lately several additional bungalows are now required, and the building of some of these should be taken in hand without delay to meet present requirements.

Water Supply.—The water supply of the Settlement remains in the same uncertain state. For three or four months between January and May our position as regards this all-important question is certainly precarious, owing to the defective storage arrangements. With the present and prospective still further increase in the number of residents, something must be done to make the water supply more certain and more ample than it is at present during the dry season. With an annual rainfall of 160 in., it only requires efficient means of storage to secure an abundant supply during the dry season for all purposes. This is impossible with the present defective reservoirs, which seem to have been of very little use since their construction, and the periodical patching up which they undergo does not seem to improve their effectiveness, as this season our shortage difficulties began earlier than ever. This serious drawback to living at Hill Station will certainly deter other Europeans who may desire to do so from selecting it as a place of residence. The appearance of the compounds show that the permanent residents continue to take an interest in them. Defects in some of the surface drains and the waste pipe connections from bath-rooms, &c., were pointed out and partly remedied during the year; many of the latter still remain, however. Clearing the bush and undergrowth around the Settlement was carried on steadily during the year by the sanitary gang, and there is now a fairly large area cleared of excessive vegetation. The sanitary arrangements worked satisfactorily during the year, with the exception of the water supply, as already referred to above. Means of exercise and recreation (these may properly, I consider, be included under sanitation in such a Settlement as Hill Station), owing to the hilly and rocky nature of the land in the immediate neighbourhood, are limited, lawn tennis and croquet being the only games at present played, with a nine-hole golf course three miles away at the foot of the hills; this, however, can only be played on during the dry season. A third tennis court has been approved of.

A small club house or pavilion is very much needed near the tennis courts. This would be particularly useful during the rainy season, as it would obviate tennis players and others running off to their quarters whenever a sudden shower or tornado comes on; this is a rather frequent occurrence during the rains, and often means a severe wetting or getting very hot in the run uphill to one's bungalow, which in either case means the risk of a chill.

Colonial Hospital, Freetown.

(By Dr. J. B. H. Davson, S.M.O.)

Isolation Arrangements.

Owing to the outbreak of yellow fever in the town during the month of May, it was found necessary to make arrangements for the isolation of patients suffering from, or suspected of suffering from this disease.

Colonial Medical Reports.—No. 27.—Sierra Leone— *(continued).*

Between the beginning of June and the end of September 14 patients were admitted, their illness being diagnosed as follows: Yellow fever, 3; malarial fever, 8; pleurisy, 1; influenza, 1; rheumatism, 1. Of these 9 recovered and returned to work; 4 recovered and were invalided; 1 died (yellow fever).

For the purpose of isolating natives at the hospital, eleven beds on the male side and five beds on the female side were provided with mosquito netting.

Four cases admitted into these beds were diagnosed as yellow fever; three of them died and the *post-mortem* examination confirmed the diagnosis.

Cases Treated.—The number of patients admitted into the hospital this year, *i.e.*, 1,500, is the largest since the year 1904, when it reached a total of 1,098. No doubt the presence of trained European nurses gives confidence and encourages patients to come.

The number of out-patients treated has increased from 27,474 last year to 31,795 in 1910.

Beriberi.—Between the months of August and November twenty-seven cases of beriberi were admitted to hospital. They were characterized by the presence of a very marked ataxia, comparatively slight muscular weakness, and almost entire absence of sensory symptoms. As a rule there was slight cardiac disturbance and no dropsy.

Five of these patients died, and during an autopsy on one of them, conducted by Dr. Mayhew, a mass of inflammatory tissue, involving the pancreas, was found round the pyloric end of the stomach and the duodenum.

From May onwards till September the supply of native rice in Freetown fell very short and most of these people said that from July onwards they lived wholly or partly on imported rice. There were no cases in the gaol. Very little of the imported rice was used there.

Ankylostomiasis.—During the year 1904, and from time to time since, examinations have been made of the faces of patients for the purpose of estimating the degree of prevalence of ankylostomiasis among the inhabitants of Freetown. It is, apparently, often present, but during this year only seven patients have been admitted to hospital with serious symptoms that could be attributed to this infection.

Diarrhœa and Dysentery.—The number of admissions for these complaints is about the same as it has been since 1904. The number of deaths from them remains much the same.

King-Harman's Maternity Ward of the Colonial Hospital.

(By Dr. Wm. Renner.)

Of instrumental labours there were ten.

The average stay of patients in the ward was eight days.

Of patients with complications on admission there were fifty-nine.

Following are the particulars of cases which resulted in death:—

(*a*) Admitted in unconscious condition. First child born at home; second in a hammock on the way. Had frequent fits after admission; temperature went up to 108° F. Patient died eleven hours and ten minutes after admission.

(*b*) Ante-partum hæmorrhage, placenta prævia. Was admitted in exhausted condition; collapsed and died one hour and forty-five minutes after admission.

(*c*) Admitted in a weak condition seven hours after delivery. Puerperal nephritis; renal asthma. Died thirty-six hours after admission.

(*d*) Hæmorrhage, placenta prævia; had hæmorrhage twenty-eight hours before admission. Very exhausted; died an hour and a quarter after delivery (by forceps).

(*e*) Admitted in exhausted condition; head of child born; shoulders fixed; arms brought down and child delivered. Died of exhaustion two and a half hours after delivery.

The admissions during the year have steadily increased.

The Nursing Home.

This institution, for the use of Europeans only, is managed by European nurses.

There were 60 admissions during the year, 10 more than the previous year. During the past year the number of patients was 60, with 4 deaths, due to blackwater fever, 1; yellow fever, 3.

The admissions were ten more than the previous year. The amount received in fees for admission and treatment during the year was £233 5s., being £64 18s. 2d. more than the previous year.

The Gaol.

(By Dr. Davson.)

Throughout the year the prisoners have been divided, the majority being kept at the gaol and the rest (averaging about one hundred) at the temporary building on the site of the new prison. This distribution of prisoners has tended to promote good health, except for the fact that those at the Botanic Station (new prison) appear to be more liable to attacks of diarrhœa. As all prisoners have the same food and water this is probably due to less perfect supervision enabling them to obtain articles of diet they should not have.

There are in the gaol several old people and some others very weakly who suffer from chronic diseases, such as asthma, heart disease and elephantiasis. Those have to be employed always on light tasks.

During the year there have been four executions in the gaol and five deaths from disease, *i.e.*, three from heart disease and one each from general debility and phthisis.

Kissy Institutions.

(By Dr. W. F. Campbell.)

There has been no epidemic amongst the inmates throughout the year. During the year the old and defective building in which cells are provided for

Return of Diseases and Deaths in 1910 in the Colonial Hospital, Freetown, Sierra Leone.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases treated
Alcoholism	5	2	5
Anæmia	11	1	11
Anthrax	—	—	—
Beriberi	27	9	27
Bilharziosis	—	—	—
Blackwater Fever	1	—	1
Chicken pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	46	10	47
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	26	6	27
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	21	2	23
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	3	—	3
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever	118	2	120
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	10	3	10
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	1	—	1
Mumps	—	—	—
New Growths	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	—	—	—
Other Diseases	40	10	41
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	87	—	89
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	1	1	1
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	—	—	—
(*a*) Primary	4	—	4
(*b*) Secondary	13	—	16
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	13	6	13
Trypanosoma Fever	2	1	2
Tubercle	28	10	28
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

	Admissions	Deaths	Total Cases treated
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	7	4	7

LOCAL DISEASES.

Diseases of the –			
Cellular Tissue	7	2	7
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	14	2	14
(*b*) Other Diseases	9	5	9
Digestive System	—	—	—
(*a*) Diarrhœa	35	9	35
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	12	1	14
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	3	2	3
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	11	1	11
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	41	1	42
Ear	1	—	1
Eye	15	—	15
Generative System	—	—	—
Male Organs	17	1	21
Female Organs	124	5	125
Lymphatic System	37	1	37
Mental Diseases	6	—	6
Nervous System	38	9	38
Nose	1	—	1
Organs of Locomotion	4	1	5
Respiratory System	56	9	57
Skin	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	2	—	2
(*f*) Other Diseases	135	1	140
Urinary System	34	5	36
Injuries, General, Local	135	6	145
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other injuries	—	—	—
Parasites	—	—	—
Ascaris umbricoides	—	—	—
Oxyruis vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tapeworm	—	—	—
Poisons	2	1	2
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations	232	8	240
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

the accommodation of violent female lunatics was pulled down, and much needed additions and alterations in connection with the asylum were carried out. These consist of a new block containing cells for violent cases and a hospital ward; a new washhouse and latrine have also been provided, as well as separate kitchens for patients and female attendants. The administrative block has also been rebuilt giving more ample and suitable accommodation for the attendants, and the dispensary with the medical officer's office and consulting room.

Only the quietest and most sensible of the lunatics were employed in laundry and gardening work. The vegetables grown by the inmates were sold in Freetown, and the proceeds devoted to the purchasing of articles such as biscuits, cakes, coco-nuts, tobacco, &c., for their use.

Female Incurable Hospital.—There were 29 patients at the beginning of the year; during the year 56 patients were admitted, making a total of 85 under treatment.

There were 26 discharged, 26 deaths, and 33 remaining in hospital at the close of the year.

The deaths were due to syphilitic exhaustion, senility and paralysis.

Male Incurable Hospital.—Seventy-one cases were under treatment at the beginning of the year, 136 were admitted during the year, 73 were discharged, and 52 deaths occurred from old age, exhaustion, syphilis and paralysis; and 82 patients were remaining in hospital on December 31. Owing to the serious nature of the cases, and the advanced stage in which many are admitted, the death-rate is always high.

Infectious Diseases Hospital.—At the commencement of the year there was one case of chicken-pox; six cases of chicken-pox and one of small-pox were admitted during the year, all aborigines, and all were cured. The case of variola was of a mild form; the patient came from the Protectorate.

Protectorate District Reports.

RONIETTA DISTRICT.

HEADQUARTERS—MOYAMBA.

(By Dr. J. Y. WOOD.)

Out-patients.—Total number of attendances of all classes was 4,155, an increase over last year of 592, showing a steady increase in this department from year to year.

In-patients.—Twenty-four compared with thirty-eight in previous year, a decrease of fourteen, possibly acounted for by the frequent change in medical officers. The number of operations during the year was six, all being minor cases. The prevalent diseases during the year in order of frequency were: Rheumatism, constipation, pulmonary complaints, wounds and injuries, skin diseases, including ulcers, venereal disease and malaria.

Dysentery was not very prevalent, and leprosy seldom seen. There were two cases of bilharziosis, verified by microscopic observation, and three cases of suspected trypanosomiasis, all children with symptoms of enlarged glands and constant sleeping, one case terminating in death. None were verified or treated, as the people refused to leave the children under observation at the hospital.

Elephantiasis is very common, both of the leg and scrotum, but cases seldom came for treatment, and operation was almost always refused.

Venereal Diseases.—Gonorrhœa appears to be more prevalent in the outlying parts of the district than in the neighbourhood of Moyamba. Primary syphilis is very rarely observed, and but few cases of undoubted secondaries; but ulcers, very suspicious both from situation and appearance, improving or disappearing under anti-syphilitic treatment, are very common in both sexes, although more frequent in men. I have not seen any definite case of hereditary syphilis.

Although gonorrhœa is commonly recognized by the natives as venereal under the term "women palaver," syphilis is not at all recognized as such, and secondary manifestations are treated purely as local.

Water Supply.—This is from two sources, a small river used by the inhabitants of Moyamba and also by Europeans for washing purposes, and a mountain spring three miles away used by Europeans for cooking and drinking purposes. A scheme for conveying it in pipes would be of the greatest benefit.

Sanitation.—The pail system, worked by prison labour, is in use among officials and works very well; all rubbish is burnt or buried. Among the Creoles in the town the cesspit system is in use, each cesspit being closed when full. A few of the chiefs and wealthier natives are also adopting this plan. Some of the towns visited on patrol are also adopting the cesspit system, in some cases even erecting public cesspit closets. Moyamba town has been kept fairly clean during the year, the chiefs usually readily cleaning up any neglected part on its being pointed out to them. The Creole portion of the town continues to give the most trouble owing to there being no one there with sufficient authority to get things put right. As a rule the Creole part of the population seem to be much more careless as regards clean surroundings than the natives, and are not so ready to clean up when their attention is drawn to insanitary conditions, paying much less attention to arguments in favour of sanitation. Bottle borders, a fruitful source of mosquito breeding places during the rainy season, are in great favour among them.

Sanitary Patrols.—During the year extended patrols were undertaken, and at each town where a halt was made sanitation, on the lines suggested in Standing Instruction No. 5, was explained to the chiefs and the people as simply as possible, and all were urged to co-operate in carrying out the suggestions.

I am of opinion that more frequent and more extended patrolling by medical officers would lead to very great improvement in general sanitation and consequently in general health among the natives, for here, as elsewhere, the two go hand in hand, the dirtiest towns being always the most unhealthy.

RAILWAY DISTRICT.

Bo and Kennema Stations.

(By Dr. J. McConaghy.)

There are 118 schoolboys at the Bo Government School. Three hundred and five days is the aggregate amount of time lost by the permanent staff through illness.

The health of the European officials has, on the whole, been good. Two Sierra Leonean officials died during the year, one of pneumonia and one of mitral regurgitation.

The number of out-patients treated at the dispensary during the year was 1,159, being an increase of just one patient over last year. The amount collected in out-patients' fees was £2 2s.

Forty-two in-patients were treated in the hospital. There were six deaths in hospital, four being due to cardiac disease, one to pneumonia and one to diarrhœa. There were eight operations performed under chloroform.

The health of the children at the Bo School has on the whole been good. There was one death, due to acute general peritonitis. During the year a fortnightly inspection of all the boys has been held with the object of detecting chiggers and skin diseases.

All the bungalows in the European Compound are extremely hot during the day. The Medical Officer's bungalow has been improved by widening part of the veranda. This addition practically forms an extra room and is fairly cool in the evenings. Charcoal has been placed between the galvanized iron roof and the ceiling. A site for quarters for an engine driver was chosen in the European Compound, and the building commenced before the end of the year. This house is being built of stone. A new rest house has been built near the railway station. It contains four rooms, with a veranda running right round the house. It is double-roofed, the outer roof consisting of thatch, and the inner of galvanized iron. The house is cool, but the outer roof leaked during the rains, and, as a consequence, the veranda was always damp during that season. The whole house is built of mud.

The water supply of Bo is quite inadequate. The auxiliary supply, which is brought from Kennema in aluminium bottles during the dry season, obviates the difficulty of obtaining drinking water, but when the dry season is advanced, water for general purposes, such as bathing, is scarce. There is a sanitary gang of twelve men who empty latrines, remove household rubbish, &c., and look after the cleanliness of the Compound generally. The question of sanitation in the town of Bo itself is most unsatisfactory. In addition to the natives there is a large Sierra Leonean population. The Chief does not appear to have much authority over the people, and it seems to be almost impossible to make the inhabitants generally realize the importance of keeping the town clean.

Only 295 vaccinations were done during the year The people objected strongly to be vaccinated during the famine, when they were in a chronic state of hunger.

A patient suffering from small-pox came to the dispensary. He was isolated and recovered. It was found that he had come from Blama. A vaccination patrol was made to Blama, and vaccinations performed. Biting flies are not plentiful in Bo. Those found belong for the most part to the Tabanidæ. I have not seen any tsetse.

Kennema Station.

The Medical Officer of Bo has paid weekly visits to Kennema during the year. The health of the European officials was good. Among the native officials the Court messengers have suffered most. The nature of their duties entails a considerable amount of exposure.

There is no hospital in Kennema and all patients are treated at the dispensary or at their own houses when seriously ill. There was one death in the gaol from pulmonary tuberculosis, and there was also an outbreak of beriberi in the gaol, seven cases occurring at the same time. The patients were isolated in a native house outside the prison. All the prisoners were accommodated in huts outside the gaol, and the gaol thoroughly disinfected. All the patients recovered.

The Court messengers' quarters are very comfortable and situated in well-laid-out lines, with masonry drainage, and water laid on to a standpipe.

The water supply at Kennema is excellent, as the water is obtained from an uncontaminated source on the hills led down in pipes and distributed by standpipes.

Sanitation.—Pail closets are used by the Europeans and native clerks and in the prison; the contents are emptied into a trenching ground by prisoners every morning.

Station—Daru (Headquarters of the W.A.F.F.).

(By Dr. J. C. Murphy.)

Since the last Annual Report was written the general health of the officials has been fair, and there has not been any very severe sickness amongst them.

Ten Europeans and eleven natives were placed on the sick list for a total period of seventy-two and seventy-four days respectively.

About twenty Europeans resided in the station for varying periods of a month upwards, others passed through, staying for a night or so. One officer W.A.F.F. and one railway platelayer were invalided to the Nursing Home, Freetown. A fair proportion of the Europeans residing for long periods at Daru had suffered from diarrhœa with transient mild symptoms of dysentery, not sufficiently severe, as a rule, to necessitate placing them on the "sick list." The drinking water is obtained from the rain water collected from the roofs and stored in tanks. There is a plentiful supply of water for domestic and other uses; it is obtained chiefly from

LONDON SCHOOL OF TROPICAL MEDICINE.

43rd Session. October—December, 1913.



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On the Ground.—H. W. Furnivall, L. Mascarenhas, G. R. Vohra, J. Atkinson, C. B. Mack, A. C. Wilson, N. Seppelt (*House Surgeon*), G. Verspyck-Mynssen, L. R. Sharples, T. B. Marshall, J. K. A. Hofmeyr, A. R. Paterson.
Absent.—R. T. Leiper (*Helminthologist*), Miss M. Plum, J. J. Urwin (Maj. I.M.S.), E. M. Merrins, A. I. Jackson, G. Rollason, J. S. Smith, H. Ellis, A. C. Rendle, H. C. Hodgson, G. D. Carpenter, W. Kennedy, W. P. Beal, H. E. Shortt (Capt. I.M.S.).

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LECTURES AND DEMONSTRATIONS DAILY BY MEMBERS OF THE STAFF.

There are three Sessions yearly of three months each, viz., from October 1st to December 31st, from January 15th to April 14th, and from May 1st to July 31st inclusive. Women Graduates are received as Students.

Certificates are granted after Examination at the end of each Session, and the course is accepted by Cambridge University as qualifying for Admission to their Examination for the Diploma in Tropical Medicine and Hygiene, and by London University as Study for the M.D. in Branch VI. (Tropical Medicine).

Fee for course £16 16s.; shorter periods by arrangement.

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A syllabus, with the general course of study, can be had on application to the undersigned, from whom further information may be obtained.

Students of the London School of Tropical Medicine, who join the London School of Clinical Medicine, will be allowed an abatement on their fees and *vice versâ*.

Chief Office—SEAMEN'S HOSPITAL, GREENWICH, S.E.

the Moa River. This river is of considerable width and force with a rocky and sandy bed. Cataracts just above barracks tend to make the water turbid and prevent sediment settling down. On the whole the sources of water supply are good. Fresh food is usually obtainable, and adds to the health of the station.

Vaccination.—238 persons were vaccinated during the year; there were only nine failures.

Meteorological observations are taken daily, total rainfall for the year was 95·40 inches.

Weekly inspection of barracks, latrines, &c., have been arranged. Cutting of grass in compounds, also of small shrubs, is from time to time carried out by fatigue parties, and the station kept clean and free from excess in vegetation.

KOINADUGU DISTRICT.

HEADQUARTERS—KABALLA.

(By Dr. J. S. PEARSON.)

The general health of the officials and Court messengers has been good throughout the year. No deaths or invalidings have occurred among officials.

Extern Department.—There have been 517 attendances. The most interesting case was that of trypanosomiasis. This patient, a boy, aged 15, living at a village about a day's walk from here, refused to stay in the hospital to be treated.

Intern Department.—Three cases were admitted into hospital. One was a case of rather serious contusions to the leg, and two of elephantiasis of the scrotum. These latter two were successfully operated upon. They both weighed from 30 to 40 lb. each.

Sanitation.—The compounds around the officials' quarters and those of the Court messengers have been kept clean and in good order. The bucket latrines of the officials were daily attended to by the prison gang. In the Court messengers' barracks the pit system is in use. These pits are periodically filled up and new ones dug, and are inspected at regular intervals.

Water Supply.—The water supply has been excellent.

Patrols.—The different districts around have been visited fairly regularly. The Chiefs were spoken to in regard to the cleanliness of their towns, where to keep their cattle, and in a general way how to keep down any infectious diseases that may at any time appear. Vaccinations have been regularly carried out. A very good percentage of cases were successful. There are still some towns where it is very difficult to get people to agree to vaccination.

Tsetse-flies.—As far as one can surmise these are fairly numerous, especially in and around the towns to the north, north-east, and north-west of Kaballa. Several specimens have been sent down to the Colonial Hospital and transmitted to England.

Meteorological Observations.—The meteorological observations have been noted carefully daily, and records have been kept. The highest temperature noted was 100° F., and the lowest 51° F. The rainfall for the year amounted to 89·92 in. The greatest in one month was 17·66 in.

KARENE DISTRICT.

HEADQUARTERS—BATKANU.

(By Dr. H. E. ARBUCKLE.)

The health of the officials here has not been very good, two Europeans and 51 native officials being on the sick list, and four officials being invalided, including the District Commissioner, Mr. Burra, and the Medical Officer, Dr. Alexander.

The most prevalent diseases were constipation, syphilis, bronchitis, and rheumatism.

The water supply is from the Mobile River, and, although not particularly good, is not so bad as previous reports would show. The river is big, and there is no town or farm nearer than at least two miles above Batkanu. The water is boiled and filtered before use by the Europeans.

There are two wood and iron bungalows in Batkanu. One is a double one, occupied by the District Commissioner and his assistant. The bungalow is raised on concrete pillars about 10 ft. from the ground. It is divided by a single wooden partition, and each side consists of a single room, surrounded on two sides by a closed veranda. The house is very hot, and to make things worse, many of the windows must remain shut to keep out bees, of which there are three swarms in the walls. The bungalow occupied by the Medical Officer is raised only one-third foot, and consists of two rooms, with a low ceiling; it is very hot, especially in the dry season, but now the District Commissioner has given orders for the roof to be covered with grass. If the bungalows at Bo were deemed not fit for human habitation by Professor Simpson, much less are the bungalows in Batkanu. The Court messengers and clerks live in houses which are within 100 yards of the Europeans' bungalows; the native village of Batkanu is only about 200 yards away, and is separated from the bungalows and office by a belt of bush which is within 80 yards of the Medical Officer's bungalow and the District Commissioner's office. This bush is used as a burial ground by the town, and also for the deposition of human excrement; it is therefore very objectionable, but as it is regarded as sacred by the Chief and his people, it cannot be touched. On sanitary grounds it would be most desirable to alter the headquarters of this district.

Sanitary patrols into outlying parts of the district have been undertaken by Dr. Murphy and myself. The Chiefs seem grateful for the information given them, and will, I believe, act on the Medical Officer's advice. On these patrols I carry a stock of medicines, and after addressing the Chief and his people on elementary sanitation, out-patients are given free medicines.

In the rainy season, owing to the annual overflow of the river, mosquitoes are fairly common, and their destruction is practically impossible. *Glossina palpalis* is, or rather, was, very common, but since I have been here this year I have not yet come

across any. I found several specimens of the *Glossina morsitans*, in December, not far from the Small Scarcies River north of Samaia.

The pail system of closet is in use in all Government quarters here, and gives satisfaction. The pails are emptied in a trenching ground a little distance away from the Court messenger lines.

The Court messenger lines are inspected every week and are kept very clean.

A station gardener has been appointed, and his duties are to plant vegetables and look after them, so that the officials may have some green vegetables, which are an enormous boon to the unfortunate officials stationed in this very "hungry" station.

The water for the Europeans could be improved greatly if tanks were built here to catch the rain from the roofs of the bungalows.

Sherbro.

(By Dr. R. W. Orpen.)

The health of the European staff during the year has been good, also the health of the native officials; no serious case was seen.

There are about thirty-five Europeans employed with various mercantile firms in Bonthe; on the whole the health of these has been good, but I regret to say that during the year two deaths took place, the cause of one being blackwater fever, the other being hyperpyrexia due to pernicious malaria.

The diseases seen in the out-patients' department vary greatly. The following are most often seen: Malaria, syphilis (second and third), gonorrhœa, skin affections, rheumatism, bronchitis, leprosy (from time to time), elephantiasis (leg, arm, and scrotal), and deformities. Ulcers are an everyday occurrence.

Vaccination.—Vaccination was carried out during the early part of the year; the number of successful cases seen was 141.

The gaol has been visited regularly twice a week and all prisoners examined on admission.

Bonthe—Sanitation Report, 1910.

(By Dr. Orpen.)

The town is roughly cut in two by a large swamp called Heddle Swamp. This at low tide is an area of foul-smelling mud; at high tide it is full of water, being assisted by the stream which flows into the head of the swamp. A portion of the swamp has lately been filled in and houses erected, and I note that there is apparently some further filling in about to take place. The material used for this purpose is turf cut from the island opposite Bonthe. It makes a good, firm soil.

The sanitary authority is the Sherbro Municipal Board, of whom the Medical Officer for Bonthe is an *ex-officio* member. It employs sanitary inspectors, six sanitary police, and two scavengers; there is also a gang of men, twelve in number, whose duties are keeping the grass short in the streets, &c. The duties of the scavengers consist of cleaning public latrines, removing nuisances, night soil, &c.; it is quite obvious that the number of scavengers is quite too small. The work done is done in an insufficient manner, bottles, tins, &c., are to be seen lying in every street. Three hammocks of the same type as used in Freetown have been ordered for removing rubbish, as the cart owned by the Sherbro Municipal Board is a quite impossible article. The rubbish, &c., is now being dumped at the head of Heddle Swamp, and an attempt is being made to fill in some ground.

Water Supply.—This is a question of great importance, owing to the shortage of water in the dry season. The Government has constructed two tanks (concrete) with catchment areas. This makes four tanks of total capacity 64,000 gallons; but I do not think that the tank of the Government Hospital should be taken into consideration, as it is used for hospital purposes, although there is a stand-pipe in the street in connection with the tanks. I do not think that these tanks during the dry seasons will be able to supply the wants of Bonthe. The usual method of obtaining water here is to dig a well; water can be obtained at any point from 3 ft. to 12 ft. There are 116 wells in Bonthe; about two of them are properly covered; they are usually situated in a compound in close proximity to a house, and thus liable to contamination. Ten pumps are now in process of being erected, but are quite inadequate for the requirements of Bonthe. I suggest that twenty more be supplied, and then, by closing the wells at the various areas where the pumps are situated, a very large number of places where mosquitoes breed and flourish would be removed.

Water does not lodge in the streets owing to the porous sandy soil. I am informed that some of the drains are used in the rainy season as places for washing clothes. Other drains have never been finished, concrete sections being just placed together and not jointed; mosquito larvæ have again been found there.

Latrines.—There are only three public latrines in Bonthe, two situated on piers running out over the water; the other is a dry earth closet situated close to the District Commissioner's office, a very bad situation, and far too close to public and private buildings.

DISPENSARY DISTRICTS IN THE PENINSULA.

Regent, Waterloo, Hastings, York, Tombo, Mano, Salija, Bananas Islands.

The prevailing diseases treated at the above-mentioned dispensaries were: Chest affections, chiefly bronchitis; dyspepsia; intestinal worms; intermittent fever of a mild type; rheumatism, chiefly muscular; venereal diseases; ulcers; a few cases of yaws.

Vaccination was carried on fairly regularly by the dispensers with varying success.

Sanitation also received attention from the dispensers, who take every opportunity to bring to the notice of the people insanitary conditions in their villages and compounds.

There has been a large increase in the total number of patients treated by the Medical Department during the year, the total number of cases treated being 87,094.

Of those treated 22,441 consisted of officials, &c., who are entitled to free medical attendance, and paying patients; and 64,653 were paupers and received free treatment and medicine. The actual amount expended for medicines, &c., was £1,279 12s. 1d. The amount received from paying out-patients was £65 2s. 11d. It is well known that a large number of people attend the Government dispensaries and hospitals as pauper patients who could very well afford to pay for attendance and medicine, but it is, as in England, a difficult matter to prevent this abuse.

Colonial Medical Reports.—No. 28.—Leeward Islands.

MEDICAL REPORT FOR THE YEAR 1910.

By FREDERICK L. NORRIS, M.B., C.M.

Chief Government Medical Officer.

Vital Statistics.

The estimated population on December 31, 1910, was 36,160. No accurate account has been kept of the amount of immigration and emigration in past years. This will be remedied in the report for next year, as a Census of the population was taken on April 2 last, and arrangements have now been made for the keeping of an accurate record of the number of departures from and arrivals in the Presidency.

There were 1,184 births, being an estimated rate of 33·19 per 1,000, against 32·55 in 1909.

There were 982 deaths, an estimate of 27·53 per 1,000, as against 27·38 per 1,000 in 1909.

The deaths of children under 1 year were 248, or 25 per cent.; this is, of course, exclusive of stillbirths, and I am of opinion that the vital statistics are really more favourable than they appear, as the population is probably over-estimated.

Meteorological Condition of the Seasons.

The general rainfall for 1910 was 34·77 in., being 10·2 in. below the average for the past thirty-seven years.

The greatest rainfall was in the third and fourth quarters of the year.

First quarter	7·22 in.
Second ,, ...	5·28 ,,
Third ,, ...	13·77 ,,
Fourth ,, ...	12·19 ,,

The highest temperature prevailed in the fourth quarter of the year, and the lowest in the first quarter.

The wind travelled at its greatest velocity during the second quarter of the year.

Relative Mortality.

First Quarter:

Malaria	7
Zymotic diseases	2
Tuberculosis	17
Diseases of the respiration other than tubercular	30

Second Quarter:

Malaria	3
Zymotic diseases	5
Tuberculosis	11
Diseases of the respiration other than tubercular	28

Third Quarter:

Malaria	2
Zymotic diseases	4
Tuberculosis	15
Diseases of the respiration other than tubercular	21

Fourth Quarter:

Malaria	4
Zymotic diseases	3
Tuberculosis	20
Diseases of the respiration other than tubercular	51

Total:

Malaria	16
Zymotic diseases	14
Tuberculosis	63
Diseases of the respiration other than tubercular	130

Vaccination.

Seven hundred and ninety-six successful vaccinations were performed, which is a decrease from last year. Probably it is due to children having been so thoroughly vaccinated the year before.

The number compares favourably with the number of births.

Malaria.

There is a marked decrease in the number of deaths from this disease. There have been only 16 deaths for the year. Last year there were 46.

This is a very satisfactory state of affairs. In my opinion, I believe that it is largely due to more attention being paid to the clearing up of bush and the cleaning out of streams and ponds and keeping

down of mosquitoes, which are much fewer this year.

The yards in the city were carefully inspected, and cart-loads of receptacle and rubbish cleared out.

Yaws.

Compulsory notification of yaws was introduced towards the end of the year, therefore no definite return can be made of this disease just yet.

There has been no outbreak of any serious infectious disease during the year. Influenza has been present at times during the year.

I attach meteorological summary and mortality report.

Table showing the Number of Deaths from each cause during the Year 1910.

(*a*) *General Diseases:*

Zymotic (epidemic, endemic, or contagious) or eruptive fevers	14
Malarial fever	16
Yellow fever	—
Animal parasites, including filariasis, ankylostomiasis, and intestinal worms	36

(*b*) *Sporadic Diseases:*

Cancer and other malignant diseases	14
Tubercular disease	63
Syphilis	13
Yaws	—
Leprosy	3
Diseases of the brain, spinal marrow, nerves, and senses other than tubercular	81
Diseases of the heart and blood-vessels	89
Diseases of the lungs and other organs of respiration other than tubercular	118
Diseases of the stomach, liver, and other organs of digestion	172
Diseases of the kidneys	25
Other diseases of the urinary organs	8
Diseases of the womb, &c.	—
Childbirth	6
Rheumatism, diseases of the bones, joints, &c.	2
Diseases of the skin, cellular tissues, &c.	21
Malformations	1
Premature birth	12
Atrophy	46
Senile decay	85
Sudden	2
Violence, privation, poison, intemperance, &c.	6
Stillborn	102
Diseases of uncertain seat, dropsy, marasmus, &c.	47
Total of deaths for the year	982

Meteorological Summary, 1910.

Month	Thermometer Max.	Thermometer Min.	Dew Point 9 a.m.	Wind. Average per hour	Rainfall
January	82°	66°	64·4	6·7	3·44
February	88	66	63·7	11·0	1·23
March	86	66	64·3	6·7	2·55
April	84	68	64·9	7·8	2·72
May	84	70	66·2	9·1	1·22
June	87	71	68·0	10·6	1·34
July	87	70	69·0	11·9	3·73
August	87	69	70·3	9·6	3·86
September	86	70	70·3	4·7	6·18
October	87	71	70·6	3·4	3·43
November	89	70	70·4	2·9	4·32
December	86	68	68·7	5·9	4·40

Highest maximum temperature, 89° on November 2.

Lowest minimum temperature, 66° on January 11 and 19, and February 4.

Highest barometer, 30·187 on February 17.

Lowest barometer, 29·820 on October 21.

Greatest rainfall in 24 hours, 2·04 on November 2.

Greatest number of miles run by wind in 24 hours, 375 on July 5 and 8.

Earthquakes record, 4—on June 21, October 16 and 29, and December 24.

Colonial Medical Reports.—No. 29.—Fiji.

MEDICAL REPORT FOR THE YEAR 1910.

By G W. A. LYNCH.

Chief Medical Officer.

Vital Statistics.

The estimated population of the Colony at the end of 1910 amounted to 135,391, as follows:—

Race		Totals at last Decennial Census (1901)
Europeans and other whites ...	3,402 ...	2,459
Aboriginal Fijians	87,460 ...	94,397
East Indian immigrants (including their children born in Fiji)	39,287 ...	17,105
Melanesian immigrants ..	2,900 ...	1,950
Natives of Rotuma	— ...	—
Half-castes and other degrees...	1,850 ...	1,516
All others	492 ...	467
Total	135,391 ...	120,124

These figures show an increase of the total population during the year of 1,560.

There is a small increase of 70 reported from the Registrar-General's figures among the Fijians. The large increase among Indians is due for the most part to immigration. The actual figures are: Europeans (increase), 9; Fijians (increase), 70; East Indians, including their children born in Fiji (increase), 3,881; Melanesian immigrants (decrease), 104; mixed and miscellaneous (decrease), 99.

The total number of births were less than those of the previous year, even excluding the Rotuma figures; there were decreases in European, Fijian, Melanesian, and half-caste births, the only increases being among Indians and "others."

The marriage rate was higher by 117.

The deaths registered were higher in every case.

The total birth-rate (omitting Rotuma) in the population for the year of all races was 37·12 per mille; in 1909 the rate was 38·19 per mille.

The European birth-rate was 26·16 per 1,000; Fijian, 38·61 per 1,000; Indian, 37·28 per 1,000.

The death-rate (omitting Rotuma) was 35·44 for all races. The rate for Europeans was 19·10 per 1,000; Indians, 25·91; Fijians, 41·24.

The excessive death-rate among Fijians is to be accounted for by the general epidemic of dysentery, which had specially bad results among native Fijians.

Diseases.

Dysentery.—The chief disease for the year was dysentery, which, after the hurricane in March, spread almost throughout the whole group, and was specially virulent among the natives in certain parts of Vitilevu. The disease also prevailed to an acute extent in the Suva district—it was again marked in the gaol, but was prevalent all over the Suva district, and was also very extensive in the Rewa district.

At the Colonial Hospital there were 361 admissions and 17 deaths; at the provincial hospitals there were 347 admissions, with 54 deaths; at the plantation hospitals there were 1,176 admissions, with 84 deaths.

The returns from native medical practitioners are incomplete; moreover, they are not an accurate indication of the disease in the provinces, since so many sick people refuse to see them on their visits. The figures available, however, show that there was a very large and very general outbreak, which became very much more marked after the hurricane, and in consequence of the hardships entailed by its destruction of houses and by the very prolonged wet season.

The admissions to the Colonial Hospital by months were: January, 69; February, 38; March, 16; April, 31; May, 49; June, 40; July, 36; August, 18; September, 17; October, 12; November, 13; December, 26; showing a fall from January to March, a rise after the results of the March hurricane were felt, then a gradual marked fall in the cooler months of the year, with again an inclination to a rapid rise with the approach of the hot weather. The type of the disease has been in some cases severe, and the majority of cases have been bacillary in origin.

In regard to dysentery, much investigation work was carried on by Dr. Philip Bahr, who was sent out to Fiji on a special mission to investigate the origin and cause of the disease in Fiji. Dr. Bahr was temporarily attached to the Colonial Hospital as Hon. Pathologist, and carried on his investigation there on all cases of dysentery admitted, working in his private laboratory.

Enteric Fever.—Enteric fever again prevailed in some parts of the Colony, notably in scattered and far separate parts of the Rewa district; but there was no great outbreak as there was in this district in the year before.

There were only seven admissions to the Colonial Hospital—two Europeans brought from outstations, and five Indians in one family brought from a suburb in Suva; from these latter no spread was reported—the cases were reported and admitted to hospital early.

Tuberculosis.—One hundred and twenty cases of all forms of tuberculosis were admitted to the Colonial Hospital during the year with a mortality of 34 cases.

The admissions to the provincial and plantation

hospitals for this disease also continue to be numerous, in spite of circulars and warnings frequently issued by medical officers and native medical practitioners.

Influenza.—This disease continues to prevail in a mild form; it appears throughout the Colony and attacks all races, except in Rotuma. The after effects are not usually severe; in that island, however, the death returns are considerable from the sequelæ.

Dengue Fever.—Dengue fever still prevails, and occurs in limited outbreaks, generally in a very mild type. Forty-two cases were treated at the Colonial Hospital, of whom 27 were Europeans.

One hundred and eighty-three cases were also treated in the plantation hospitals. A fair number of cases, however, were so mild as not to require treatment, or at any rate not to require hospital treatment, causing merely two or three days' inconvenience.

Tinea Imbricata.—This skin disease continues to be largely treated in the provincial hospitals and by native medical practitioners, and very good results are reported on all sides from the persistent use of sulphur fumigation, more especially in old standing cases. This is satisfactory, for it is a far less expensive method of treatment than that by chrysarobin or the expensive iodine.

Frambœsia.—Frambœsia in young children, especially in the more distant and less frequented parts of the Colony, continues to be responsible for much sickness amongst children, and consequent mortality. As natives slowly become more enlightened they bring their children with more confidence for treatment; but the process of their education is discouragingly slow, and meanwhile an increasing number of Indians become affected.

Leprosy.—The station on the island of Makogai made some progress during the year, but there were many delays in the work and many disappointments in the progress of clearing and cultivating the land.

There was no material change in the conditions of the lepers at Beqa—the numbers there remain about the same as last year.

Ankylostomiasis.—The records of this disease rather tend to show that it is increasing. Seventy cases were treated at the Colonial Hospital, while at the plantation hospitals 404 cases were treated.

Vaccination.

Vaccination was carried out as usual all through the Colony.

Government Pharmacy.

The work at this Government Department steadily increases with the increasing number of medical stations and native medical practitioners' stations. Two natives have been assigned as apprentices, who assist in packing and sorting of drugs.

Bacteriological Laboratory.

A new bacteriological laboratory was at the end of 1910 nearing completion.

Colonial Hospital.

The admissions to the Colonial Hospital were 1,973. European admissions increased from 194 to 202.

There were no additions made to the buildings. It is hoped that the question of a new European block may have early consideration.

Nursing Staff, Colonial Hospital.

The insufficiency of the nursing staff continues, and it was, in spite of much effort, short throughout the year.

The shortage is due to two causes: (1) That nurses leave the hospital as soon as they are qualified in nearly all cases, attracted by the higher remuneration obtainable by nurses in the Australian Colonies; (2) the difficulty in procuring candidates to fill vacancies as probationers. During the year two retired from the hospital and two new probationers were taken on.

The training of native women in obstetrics and the care and nursing of children continues. Twelve trained native nurses were qualified and passed out to districts. In all, 18 native nurses have now qualified and been sent to districts. Two hundred and ninety-nine cases have been attended by them in the provinces, which vary much in their appreciation of the nurses' services.

Native Medical Practitioners.

In 1910 seven students were examined and six passed and were sent to new districts; of these, three began work in January, 1911. The total number of native medical practitioners now employed is 36. The class of students remained 20. The new quarters were built and occupied, and are suitable for their needs.

Levuka Hospital.

This hospital, with the exception of a few minor matters, was finished and occupied towards the end of the year. The hospital consists of two blocks, one for Europeans, with offices and operating room, the other for natives. It is under the district medical officer of Levuka, with a native medical practitioner as dispenser, and a European nurse and native nurse in charge.

Gaol and Gaol Infirmary.

The building of the new gaol and gaol infirmary was deferred to 1911; the patients from the gaol, therefore, continue to be treated at the Colonial Hospital for the present.

New Medical District.

A new medical district is to be established in 1911 in Vanualevu, with quarters in the Savusavu district.

Return of Deaths during the Year at the Colonial Hospital.

Alcoholism, 1; ankylostomiasis, 7; acute yellow

atrophy, 1; bronchitis, 2; broncho-pneumonia, 6; carcinoma of pancreas, 2; carcinoma, 1; cerebral hæmorrhage, 2; cerebro-spinal meningitis, 2; cardiac disease, 2; cirrhosis of liver, 1; congenital syphilis, 1; debility, 3; diarrhœa, 2; diabetes, 1; dysentery, 16; empyema, 1; enteric fever, 1; epilepsy, 1; ethelioma, 1; filaria sanguinis hominis, 2; filaria adenites, 1; filariasis, 1; fractured skull, 1; general tuberculosis, 8; hæmopericardium, 1; inanition, 2; nephritis, 1; pericarditis, 1; pernicious anæmia, 1; pneumonia, 1; premature birth, 2; pulmonary tuberculosis, 17; pyæmia, 1; pulmonary embolism, 1; sarcoma of ilium, 1; septicæmia, 3; syphilis, 1; tetanus, 2; tuberculous meningitis, 1; tuberculous peritonitis, 2; tuberculosis of spine, 1; tuberculous enteritis, 1: total, 107.

Colonial Medical Reports.—No. 30.—Ceylon.

MEDICAL REPORT FOR THE YEAR 1910-11.

By Sir ALLAN PERRY, M.D., D.P.H.

Principal Civil Medical Officer and Inspector-General of Hospitals.

Section I.—Population: Birth and Death Rates.

The population enumerated at the last Census (March, 1911) was 4,105,535, and consisted of 7,625 Europeans, 26,857 Burghers, 2,714,616 Singalese, 1,059,354 Tamils, 266,454 Moors, 13,089 Malays, and 17,540 others, exclusive of the Military and Shipping; compared with the population at the Census of 1901, there was an increase of 15·1 per cent. in the decade. The natural increase by excess of births over deaths from the date of the last Census to June 30, 1911, amounted to 10,636, while the number of Indian immigrants exceeded the number of emigrants by 8,169. The population, estimated as on July 1, 1911, was accordingly 4,124,340, an increase of 127,676 persons, or 3·19 per cent., on the population at the end of 1909 estimated on the basis of the previous Census.

Section II.—Public Health.

Vital Statistics.

I regret that the returns of deaths under their respective diseases are not available yet for the period covered by this Report; but for the purpose of estimating the condition of the public health from the birth and death returns kindly furnished to me by the Registrar-General, it may be stated that the births registered during the eighteen months numbered 241,488, and were in the proportion of 39·6 per 1,000 of the population per annum estimated to the middle of the period. The deaths registered during the eighteen months numbered 171,194, and were equal to a rate of 28·0 per 1,000 of the population per annum. Compared with the year 1909, the birth-rate for the eighteen months 1910-11 shows an increase of 2·9 per 1,000, and the death-rate a decrease of 2·3 per 1,000; compared with the average rates for the twelve years 1898-1909, the birth-rate for the eighteen months shows an increase of 1·8, and the death-rate a decrease of ·5 per 1,000.

I submit herewith the number of deaths registered under their respective diseases for the year 1910 with those for the year 1909 for comparison:—

	1910	1909
Cerebro, including spinal fever ..		
Simple continued fever		
Enteric fever		
Influenza	21,906	23,903
Remittent fever		
Ague		
Diarrhœa		
Dysentery		
Dyspepsia		
Enteritis	18,730	22,932
Obstruction of bowel		
Hernia		
Appendicitis		
Laryngitis		
Croup		
Bronchitis	6,810	9,453
Asthma		
Pneumonia		
Pleurisy, &c.		
Phthisis	3,917	4,195
Diseases of nervous system ..	13,597	14,477
Tetanus	646	488
Circulatory system	618	755
Anchylostomiasis	1,592	1,486
Diabetes mellitus	139	182
Cancer	264	158
Parangi (yaws)	114	94
Leprosy	64	73
Hydrophobia	20	30
Cholera	22	8
Suicide	221	204
Snakebite	185	189

Of the above sixteen groups of diseases, it is satisfactory to note that nine groups show a fewer number of deaths in 1910 than in 1909. In the seven groups showing a larger number of deaths are tetanus, anchylostomiasis, cancer, parangi, hydrophobia, cholera and suicide.

Deaths due to Preventible Diseases.—In 1910 the total number of deaths registered was 110,195, as against 122,970 in 1909; of the former number, 14,559 were deaths due to what one may call preventible diseases, and include such as enteric fever, phthisis, anchylostomiasis, puerperal fever, malaria, cholera, hydrophobia, &c. Under this

heading, in my 1909 Report I stated that there was no control over such preventible diseases as, among others, tuberculosis, anchylostomiasis, and hydrophobia. It is gratifying to be able to state that a Bill for the control of anchylostomiasis is now being considered; that a muzzling regulation for dogs has been introduced into municipalities and most local board towns; and it is hoped that some legislation will be framed to render (*a*) the notification of phthisis compulsory, and (*b*) the highly dangerous carriers of that disease innocuous to the public.

Infantile Mortality.—The infant mortality in the thirty-one principal towns for 1910 was equal to a rate of 241·7 per 1,000 births, as against 257·7 in 1909.

The Health on Estates.—The mean birth-rate on estates for the four quarters of 1910 was 33·9 per 1,000, and the death-rate 35·9 per 1,000, compared with 36·6 and 39·6 respectively for 1909. The principal causes of death in 1910 were diarrhœa 2,788, dysentery 2,376, debility 2,108, pneumonia 1,335, anchylostomiasis 1,173, infantile convulsions 947, fevers 439, and phthisis 187. Out of these eight groups, the numbers were lower in six and higher in two; the phthisis rate was practically equal, viz., 188 in 1909 and 187 in 1910. The estate population was 420,340, based on the Census figures of 1901.

Principal Diseases.

Malaria.—The total number of persons treated for this disease in hospitals and dispensaries during the eighteen months was 877,841, an increase of 72,371 in proportion to the number treated in 1909, which may be accounted for by the occurrence of an unusually severe outbreak in parts of the Western, Sabaragamuwa, and Central Provinces after the break of the south-west monsoon of 1911 followed a prolonged drought. In hospitals alone 15,493 cases were treated, of whom 664 died. During the period under review the Western Province had the greatest number of cases, next the North-Western, and then the Southern Province. The number of admissions into gaols for this disease was 1,213, with 15 deaths. 140,592 ounces of quinine were issued from the Civil Medical Stores at a cost of Rs. 93,133. The amount of quinine expended during the eighteen months in comparison with 1909 was double. The special yearly report on malaria for 1910 was submitted under cover of my letter No. 936 of June 20, 1911, and for convenience I attach a copy:—

"The work in connection with the prevention of mosquito-borne diseases in Ceylon during the year 1910 was on the lines followed in previous years, viz., general improvement in the sanitation of towns, the education of the public by lectures and pamphlets, and the free distribution of quinine. Malaria is the most frequent form in which a mosquito-borne disease is shown here; the other forms are absent, or so rare that they may be disregarded. The deaths from all fevers was ·52 per cent. of the population. The deaths from malaria alone in hospitals was 3·4 per cent. of the admissions for that disease.

"As in the former years, no organized campaign against malaria in any particular town or district has been attempted, but a beginning in this direction has been made by His Excellency the Governor, who in May, 1910, nominated a Committee composed of the Hon. T. B. L. Moonemalle, Dr. A. J. Chalmers, and Dr. H. M. Fernando to submit a scheme for the prevention of malaria at Kurunegala, in the North-Western Province. This town has a population of 8,000 persons, and covers an area of four square miles.

"On August 1, 1911, Government approved of Dr. S. T. Gunasekara as Superintendent in charge of the anti-malarial scheme at this town; he assumed duties on September 5.

"The spleen census for the six months, January 1 to June 30, 1911, was obtained from a more carefully selected portion of the community, viz., male children attending schools, as against all children and young adults attending hospitals, dispensaries, and schools, which was the former practice:—

"For all provinces for the latter half of 1910 (north-east monsoon):—

Number examined	179,837
Total enlargment	34,935
Spleen rate	19·43
Average spleen	1·71

"For five provinces for the first half of 1911 (south-west monsoon):—

Number examined	84,226
Total enlargement	12,728
Spleen rate	15·11
Average spleen	1·56

"The result of these inquiries shows a smaller spleen rate and average spleen than that in 1909, which was:—

Number examined	317,694
Total enlargement	66,141
Spleen rate	20·81
Average spleen	1·75."

Cholera.—The total number of cases of this disease treated during the eighteen months was 410, with 266 deaths. The larger number of these cases was in connection with a serious epidemic which occurred within the last three months of the period at the quarantine coolie camp at Ragama, where there were 327 cases, with 214 deaths; other small outbreaks occurred in the Western, Central, North-Western, Uva, and Sabaragamuwa Provinces. In nearly every instance the original source of infection could be traced to South India.

The Outbreak at Ragama.—On May 3, 1911, a case of cholera occurred in a coolie who had arrived on April 29 from an infected area in India; on May 5, 4 other cases occurred, 2 from contacts of the first case and 2 from among the arrivals of May 1 and 2; on May 6, 9 cases occurred among the arrivals of April 30 and May 3 and 5; there were then about 3,000 coolies in the camp, but further arrivals continued to be received up to May 9. The disease spread rapidly throughout the various camps, and

after a small stampede, in which the coolies in the various camps became mixed, there was no possibility of keeping the divisions separate, and it was recognized that the whole number had to be considered as "infected." The rapid spread of the epidemic was accounted for as due to three possible agencies—water, food and flies. The water tanks were not fly-proof, the food was cooked on the ground, and there was a plague of flies.

The tanks were disinfected and made fly-proof; subsequent bacteriological examination proved that the wells and tanks were free from the cholera vibrios. It is probable, therefore, that the vehicle of dissemination was food or flies, or both. The food was cooked on the ground, and the ground was seriously contaminated with deposits of human excreta, much of which was cholera-infected, and, as I have remarked above, there was a plague of flies.

There were 327 coolies attacked, of whom 214 died. All the dead were cremated.

The health of the coolies rapidly improved when the new camp on another site was ready for their reception: the first batch of removals was made on May 24; after that date only 20 cases occurred in the new camp.

The last batch of healthy coolies left Ragama for their estates on June 19.

Before and during the epidemic an unprecedented drought occurred; the camp wells ran dry, and water had to be brought from Colombo, eight miles by railway. This shortage of water and an insufficiency of latrine and scavenging coolies favoured the spread of the epidemic.

I have great pleasure in placing on record the magnificent work performed by the medical officers, apothecaries, sanitary inspectors, two religious sisters, and the attendants and coolies who were employed by this Department throughout this serious epidemic. No words can convey their devotion, unselfishness, and nobleness of conduct. To their efforts is due the wonderful result achieved—the epidemic was controlled in a little over three weeks, and considering that at one time it was estimated that there were 4,000 coolies in the camp, that they were panic-stricken, that the water supply for a large part of the period was insufficient, that the sanitary force was totally inadequate and could not be strengthened, it is marvellous that only 327 coolies were attacked, and that the death-rate among them was only 65·4 per cent.

Cholera at Ratnapura.—The history of cholera during the eighteen months from January 1, 1910, to June 30, 1911, would not be complete without mentioning an outbreak that occurred at Ratnapura. A coolie arrived on Nivitigala estate on June 18 from Tataparai in India; he was attacked with the disease on the 19th idem. A second case occurred in a coolie who arrived on the 22nd idem. Seven cases developed subsequently among old resident coolies on this estate. Owing to the drought the inhabitants of Ratnapura were forced to use water from the river, which was badly smelling, and which it is assumed was polluted from the washings of the above-mentioned estate, as there was some rain during the latter part of June. The first case *in the town* was on July 2: 7 cases were reported, with 6 deaths. On July 9 a coolie was attacked on Rambukkande estate; he arrived from India on June 23. There were cases that developed in the gaol, in the hospital, and in villages as far as eight miles away. The total number of those attacked was 49, of whom 31 died. The last case was on August 11.

Small-pox.—There were 356 cases treated, with 62 deaths, during the eighteen months' period, which figures are in nearly the same proportion to those published for the year 1909. Every Province (except the North-Central) returned cases; the Western and Central Provinces were seriously affected, with 154 and 159 respectively; Kandy and its surrounding villages suffered most. The original source of infection in many cases was traced to Southern India, but in all probability some cases were connected with the 1909 outbreak. Out of the 154 cases in the Western Province, 105 were treated at the Infectious Diseases Hospital, Colombo. The total number of deaths in which previous vaccination was absent was 37. The epidemic at Kandy lasted from March 2, 1911, to the end of October last.

Enteric Fever.—816 cases were treated in 40 out of the 75 hospitals of the Island; 69 per cent. of the total cases were in Government hospitals in Colombo (not including the Jail and Municipal hospitals). There were 171 deaths, a mortality-rate of 20·9 per cent. The death-rate in Colombo hospitals was 17·5 nearly; there were 40 cases treated in the Kandy hospital, with 14 deaths; 18 cases, with 2 deaths, at Galle; 17 cases and 4 deaths at Kalmunai; 13 cases and 1 death at Dikoya; 17 cases, with 5 deaths, at Nawalapitiya. In the 18 hospitals attached to gaols there were 18 cases, with 6 deaths. The Medical Officer of Health for the suburbs of Colombo reports that the notification of cases of enteric fever is very satisfactorily carried out in the villages; notwithstanding, 264 cases were reported to him from between January 1, 1910, and June 30, 1911, and every one was seen by him. Pamphlets were left in all the infected houses with directions as to the precautions to be taken to prevent the spread of the disease. Disinfection of premises was carried out and free disinfectants issued to the poor. It is ominous that the village most affected was Kirillapone, which immediately adjoins Narahenpitiya (the Colombo night soil depôt), and that the fly pest was so great at Kirillapone and Wellawatta that "bakers could not knead their dough in the daytime, and had to do it after nightfall."

Dysentery.—This disease is rife in all parts of Ceylon. 3,710 cases were treated in the various Government hospitals, with 1,094 deaths. It is very common in the planting districts and in Colombo. In the former the water supplies are, as a rule, indifferent as to quality and liable to pollution; in Colombo this same cause is found with those who use shallow, unprotected wells. But Colombo

contains a large number of vagrants, who, as a class, easily contract this disease. 20·53 of the total treated were in Colombo hospitals.

There were 18 cases, with 6 deaths, in gaol hospitals. Most of these cases occurred at the Mahara and Mutwal gaols.

Dysentery and diarrhœa are the commonest diseases in our gaols. 4,944 admissions were recorded in gaol hospitals for the eighteen months' period, with 196 deaths (3·96 per cent. mortality). In the Colombo gaol hospital alone 1,347 cases were treated, with 69 deaths (5·1 mortality).

Leprosy.—628 cases of leprosy were treated in the Government medical institutions during the period under review, with a mortality of 63. The present accommodation for lepers is quite inadequate.

The question of a leper colony in the Eastern Province is still under consideration. There are many lepers at large, who are a source of danger to the pubic. Until they can be all isolated in a proper institution it will be impossible to stamp out this disease. At Hendala Asylum I strongly recommend that religious sisters should be employed as nurses.

Anchylostomiasis.—It is gratifying to record that this disease has received consideration since the publication of my last Administration Report; as a result of the Report of a Committee appointed in 1910 to consider this question, the attention of planters and others has been directed to it, and a draft enactment is now under consideration. The recommendations of the Committee above mentioned are:—

(1) That all superintendents of estates should treat new arrivals with beta-naphthol, followed by tonics.

(2) Where it is known that anchylostomiasis already prevails on estates, superintendents should treat the whole labour force in convenient batches in a similar manner.

(3) The drugs required for the treatment should be issued at cost price from the Civil Medical Stores; where estates have dispensaries, we recommend that the drugs required for beta-naphthol treatment may be used for Singalese as well as Tamil labourers.

(4) Medical officers in charge of districts should report to the Principal Civil Medical Officer, through their immediate superiors, the prevalence of anchylostomiasis in a severe form on any estate. In such cases the Principal Civil Medical Officer should be empowered to send an officer to inspect, report, and make recommendations for combating the disease. If the Principal Civil Medical Officer approve these recommendations, they should be communicated to the superintendent with a view to their adoption. Where these recommendations have not been carried out, Government shall be empowered to enforce the Principal Civil Medical Officer's recommendations at the expense of the estate.

(5) With regard to the question of the improvement of sanitation on estates, we recommend that every set of lines and its immediate surroundings should be cleaned and swept once every day. All sweepings should be burnt or buried. At least 12 feet clear of all vegetation must be maintained round the lines. Stone, brick rendered in cement, or cement concrete drains should be constructed to carry off rain from the roofs and from the immediate vicinity of the lines. The immediate vicinity of the lines should be on a lower level than the floor of the lines and slope downwards from them, with the object of keeping the ground surrounding the lines as dry as possible, as the hook-worm flourishes in damp earth. All excreta deposited within 50 feet of the lines should be removed daily and buried by the sweeper.

(6) At all bathing-places, whether at spouts, wells, or riverside, there should be stone or paved platforms with a properly constructed run-off drain where necessary. Wells for bathing and wells for drinking water should be kept separate.

(7) To prevent contamination of the water supply for drinking purposes, closed iron piping is strongly recommended. Wells should be lined with brick pointed with cement and have parapet walls, and a surrounding platform 4 feet wide of stone paving, cement concrete, or brick cement rendered, and a surrounding drain to conduct the waste water away. Wells for domestic and drinking purposes should be covered and provided with a pump.

(8) We would urge on all employers of labour the desirability of establishing latrines, especially for bungalow coolies, factory coolies, school children, and Public Works Department lines.

(9) The agents, visiting agents, and managers of estates should be requested to do all in their power to give effect to the above recommendations.

I would here repeat the figures showing the deaths from this disease. The Registrar-General gives the total deaths from anchylostomiasis for the whole island for 1910 as 1,592, of which 1,173 were deaths on estates; this leaves only 419 deaths from this disease for the rest of Ceylon's population, which is significant, and points to the necessity of taking active measures to prevent insanitary conditions on those estates that favour the propagation of this disease.

Many planters have improved the conditions under which their labour force live, and have carried out sanitary improvements and medical treatment without waiting to be made to do so by law, with excellent results as to improved health among the labourers and a more efficient force.

Diphtheria.—This disease is becoming more frequent, or its symptoms are more easily recognized by medical men. In the General Hospital and the Infectious Diseases Hospital, Colombo, there were 12 cases treated, with 1 death.

Chicken-pox.—8,151 cases of this mild affection were treated, with only 2 deaths.

Parangi or Yaws.—4,777 cases of this disease were treated at the various medical institutions during the eighteen months ended June 30, 1911. This number is less in proportion than the figure

3,485 given for the year 1909; the deaths for that year numbered 18, and for the eighteen months' period 40. As one of the results of the Durbar held at Kandy in July, 1910, the question of compulsory treatment of parangi patients was considered by His Excellency the Governor in Executive Council, and it was decided in October, 1910, that an experiment be made in a selected village or group of villages in order that the improvement which may be effected by providing a sufficient water supply and wholesome food should be observed. The village of Timbirigaswewa, in Tamankaduwa, about one mile from Habarana, was selected by the Government Agent, North-Central Province, in February, 1911, for the proposed experiment. The Provincial Surgeon visited this village and submitted a report on April 19, in which he said the village was a suitable one, but that it was very insanitary, the houses were filthy and ill-ventilated, water supply inadequate and precarious. He recommended clearing of the village, and brushwood to be cut down, &c.

The Principal Civil Medical Officer visited the village on July 11, and submitted a report to Government on 27th idem, pointing out that while the water supply was inadequate, the sanitary condition of the place had improved, the inhabitants looked fairly well nourished. The people present on the day of the visit numbered 60, mostly women and children; the men were said to be away at work. Only 3 cases of parangi among adults and 3 among children were noticed, which small number did not appear to justify a further continuance of the experiment.

Since the issue of the last Administration Report of the Medical Department of this Colony an epoch-making discovery in chemotherapy has been given to the world by Professor Paul Ehrlich in his preparation called Salvarsan, or 606, which is a specific for all spirochætal and spirilla infections. Parangi as a spirochætal infection was discovered by Dr. Aldo Castellani.

The salvarsan treatment of this disease has been tried in many countries, with uniformly good results; in this country Dr. Castellani has treated a fair number of cases, and the results, after one injection of the new drug, are nothing short of marvellous. Time alone will prove if this curative effect will be lasting. If this much-to-be-desired result is attained, the yearly outcry for special parangi hospitals in various parts of this colony will cease. For the purpose of putting this remedy to a more extended test, a medical officer with special knowledge of the treatment has been stationed at Anuradhapura to treat all suitable cases that may be admitted into that hospital.

Cancer.—Under this heading 264 deaths were registered in 1910, as against 158 in 1909. From these figures it cannot be said definitely that the disease is increasing in this country, because the attention of medical practitioners has been directed to the subject through many channels, notably through the reports published from time to time by the Cancer Research Fund, and these reminders may have influenced the correctness of diagnosis, which would increase the number of deaths certified.

Turning to the records of the hospitals, it is seen that the reports on the number of cases of cancer (*i.e.*, carcinomata and sarcoma together) in 1910 was the same as in 1909, namely, 121. The provincial distribution is as follows:—

	Sarcoma	Carcinoma
Central Province	—	7
Northern Province	—	10
Western Province	3	73
Southern Province	1	15
Eastern Province	1	6
Province of Uva	—	5
	5	116

No reports were received from the three other Provinces. Of the sarcomata, 2 were said to be melanotic, and the remaining 3 occurred in bone.

The carcinomata were distributed through the various parts and organs of the body, thus:—

	Females	Males	Total
Cheek	9	26	35
Cervix	19	—	19
Penis	—	13	13
Breast	11	—	11
Tongue	3	6	9
Uterus	6	—	6
Lower jaw	1	7	8
Upper jaw	—	1	1
Lower lip	1	2	3
Upper lip	—	2	2
Hard palate	—	1	1
Larynx	—	1	1
Liver	1	1	2
Skin	—	1	1
Glands	—	1	1
Omentum	.	1	1
Pylorus	—	1	1
Rectum	1	—	1
	52	64	116

Phthisis.—In the Registrar-General's returns for 1910 3,917 are shown under the heading "Phthisis," as against 4,195 in the year 1909. During the eighteen months' period there were 1,652 cases reported from the hospitals. In these reports the notified cases registered at the Municipality are not included.

On February 1, 1910, His Excellency the Governor was pleased to appoint a Commission "to inquire into and report upon the prevalence and alleged increase of tuberculous diseases in the island, and upon the most effective measures for checking the dissemination of the said disease." The Commission held six meetings, the first of which was on February 11, 1910, and the last on June 6, 1910. A large amount of evidence was recorded, and the report was issued on the latter date.

A munificent donation of £10,000 had been given to Government by the Hon. J. N. Campbell, of Ceylon, some months previously for the purpose of fighting tuberculosis.

Subsequently a public fund was started, and the public subscriptions so far collected amount to the sum of Rs. 150,000, which, with Mr. Campbell's

generous gift, makes Rs. 300,000. Mr. A. E. de Silva has given a large piece of land near Colombo which is suitable for a sanatorium, and it is hoped that this institution with a tuberculosis dispensary (largely contributed by Mr. A. J. R. de Soysa) and a hospital for chronic cases of phthisis in Colombo will be established at no distant date.

The education of the public in the question of tuberculosis and how to prevent it has been attempted by means of illustrated handbills with letterpress in the vernacular, and the Principal Civil Medical Officer has given popular lectures on the subject, illustrated by lantern views, at many towns between Jaffna and Galle.

One of the most important measures taken against this disease has been the regulation made by the Chairman of the Colombo Municipality, namely, the compulsory notification of cases of phthisis within the Municipal limits.

Vaccination.—During the period under review 251,500 subjects were vaccinated, of which 209,160 were primary vaccinations and 42,340 re-vaccinations. Of the former, 185,296 were successful and 9,871 unsuccessful; in 13,993 subjects the results of the vaccination was not known.

The percentage of successful cases to the total inspected was 95·45. For re-vaccination cases 19,585 were successful and 8,258 unsuccessful; in 14,497 the results were not known. The percentage of success in the re-vaccinated was 70·34. The number vaccinated in the eighteen months' period are larger actually, and relatively, to the figures of 1909. The successes are much higher in primary vaccinations, but less good in the re-vaccination returns. The quality of the lymph has been greatly improved; bacteriological examination at the time of collection showed the number of extraneous micro-organisms to be normal.

The buildings and equipment of the establishment have been much improved by the addition of a new office, operating-room and lavatory, by new stalls, and the fly-proofing of the rooms and stables.

The calves were not always of good quality and physique, and owing to the large amount of small-pox in parts of the island the number necessary could not always be obtained. This difficulty was got over by the foresight of the officer in charge, who had a good supply of lymph in cold storage. 515 calves were employed for the manufacture of lymph, and 104,249 tubes of lymph were issued from the establishment.

Precautions taken against the Introduction of Infectious Diseases.—During the eighteen months' period the medical staff at the port consisted of the Port Surgeon and three assistants. The total number of vessels calling at Colombo was 4,597 steamers and 633 Indian and native sailing vessels.

The following ports were declared infected: Bombay, Calcutta, Rangoon, Burma, Karachi, Tuticorin, Mangalore, Madras, Calicut, Tellicherry, Bangkok, Batavia, Sourabaya, Samarang, Mauritius, Port Said, Hong Kong, and Penang.

The number of vessels placed in strict quarantine was: For plague, 4; small-pox, 15; cholera, 4. 1,899 vessels arrived from infected ports, and, being "healthy," were permitted to work cargo as "healthy in quarantine."

No case of plague was brought to the port, but four steamers were placed in strict quarantine, having suspected cases of this disease on board, and subsequently allowed to work "healthy in quarantine," as the cases were proved not to be plague.

The prevalence of cholera and small-pox in the south of India gave rise to much anxiety, because there is a large number of native passengers arriving here daily. Towards the end of 1910 Tuticorin, the principal port on the Indian side, became infected, and remained foul for many months.

The total number of estate coolies arriving at Colombo was 152,333, and 67,574 "miscellaneous deck passengers"; of the latter, 8,863 persons were vaccinated on arrival. The estate coolies showing no marks of vaccination or of small-pox are vaccinated at the coolie camp at Ragama. The Plague Committee held its periodical meetings.

Lunacy.—The total number of patients treated in the Colombo asylum during the eighteen months' period was 872 (males 542, females 330). The number discharged was 126 (males 80, females 46). The number of deaths was 98 (males 62, females 36). In the House of Observation 292 persons were treated (208 males and 84 females), of whom 149 (males 95, females 54) were transferred to the asylum and 122 (males 100, females 22) were discharged. The accommodation provided at the asylum is inadequate for the numbers treated.

Section III.—Meteorological Conditions and their Relationship to Disease.

The rainfall for the eighteen months' period shows four areas that were comparatively dry, viz., the coast line from Kankesanturai to Mullaittivu in the north, the Mannar and Puttalam Districts in the west, the Hambantota District in the south, and a very small patch in the south-east of the centre of the island.

As usual, more rain fell in the central and south-western parts of the island than elsewhere, with three patches recording over 200 in.

In former reports the influence of the two monsoons on malaria has been pointed out; outbreaks of this disease in the western half of the island occurring after the first rains of the south-west monsoon, and a like result in the eastern half after the commencement of the north-east monsoon.

During the period under review severe malaria was experienced at the end of a long drought and after light showers, which is attributed to the preservation of malarial-bearing mosquitoes through the death of fish that feed on their larvæ.

Bowel diseases are more prevalent during the rains. Respiratory diseases are common during the chilly nights and mornings of the north-east monsoon.

Certain meteorological conditions further affect unfavourably the health of the people as regards the less quantity of food produced, and in consequence the lowered vitality to resist disease.

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SECTION IV.—GENERAL SANITARY CONDITION OF THE COLONY AND OF THE CHIEF TOWNS.

THE general sanitary condition of the Colony leaves much to be desired. Major sanitary works are very expensive, consequently improvements under this heading proceed slowly; the tendency is towards slow improvement, particularly in towns having a municipality or local board and small places that are placed under the Small Towns Sanitary Ordinance. There are many towns without a satisfactory water supply or drainage, and conservancy, scavenging, and the proper disposal of refuse are inadequately carried out. The drainage and water supplies in some of the large towns are bad, and overcrowding exists.

Colombo.

As mentioned in last year's report, the water supply is insufficient, but of excellent quality. Steps have been taken to lay a larger main in Colombo where the Labugama pipes discharge, which it is said will remedy this shortage of distribution. The laying of another main pipe from Labugama will have to be undertaken in the near future, not only for present needs, but because of the recent inclusion of two large areas within municipal limits.

The extension of the water-carriage system of sewers has made good progress during the last one and a half years. The area of those parts of Colombo that discharge into the harbour has been sewered and ready for the connections between the houses and sewers for a year, but very few connections have been made. The collection of night soil in pails, its transfer to carts in the streets, its conveyance through the city to a pitting ground on the outskirts, where it is buried, is unsatisfactory from a sanitary point of view, but it is carried out as well as such a system can be, and it cannot be changed until the water-carriage system is taken into use.

A refuse destructor is being erected by the municipality. The scavenging has been fairly well carried out, but at times there is a good deal of dust, and there is not enough watering of streets, particularly where the roads do not lend themselves to oiling or tarring.

There is a good deal of overcrowding.

A great improvement has been made by opening a new road in Slave Island known as Short's Road. Another new road to run parallel with Colpetty is under consideration, and improvements are anticipated in the markets. The plans for a Municipal Infectious Diseases Hospital are ready.

The compulsory notification of cases of consumption has been proclaimed.

Enteric fever is far too prevalent; there have been no serious outbreaks of small-pox or cholera.

Average birth- and death-rates per 1,000 of population for 1910 were 25·5 and 30·4 respectively, as against 25·27 and 30·77 in 1909.

The Rural Medical Officer of Health reports that by-laws have been framed and put in force with reference to the following: Offensive trades, eating-houses, dairies, laundries, bakeries, butchers' stalls, fish stalls, the keeping of animals, and general by-laws. The general condition of the towns and villages outside Colombo has been much improved since this officer and his inspectors have been appointed. 264 cases of enteric fever were reported to the Rural Medical Officer of Health during the eighteen months. Every report was followed by a visit by that officer to the infected house, and the friends were instructed how to deal with the case so as to reduce the spread of this disease.

There were a few cases of chicken-pox, several cases of dysentery, and only one case of cholera. There were 747 prosecutions for offences against the sanitary by-laws, and 671 convictions. The total amount of fines came to Rs. 3,031·25. The Rural Medical Officer of Health recommends that public markets should be erected in certain suburbs, and that the Small Towns Ordinance be applied to Peliyagoda and Veyangoda.

Kandy.

This town was badly affected with small-pox during a part of the period under review. The drainage has been improved, particularly in the direction of Peradeniya and Katugastota, by the provision of concrete drains. The water supply has been improved by the inclusion of a new stream to the catchment area. The supply has been sufficient and of good quality. The night soil is collected in pails and conveyed in air-tight drums to the pitting ground. The scavenging was carried out satisfactorily. The dairies, laundries, slaughter-house, and eating-houses were regularly inspected. There is a good deal of overcrowding and want of sanitation in the alleys, which was brought to the notice of the authorities during the small-pox epidemic.

Galle.

This town employs a small force for carrying out anti-malarial measures. The water supply has been improved in quantity by the opening of the new works at Hiyara. The town is now well supplied. The water from this new source is coloured brown, and therefore unattractive, but it is in no way injurious, and will improve as time goes on. Drainage was improved in the bazaars and fort, and a new sewer put down in Pedlar Street. The swamps on both sides of the Pattigala-ela below Talapitiya were filled in and the ela drained. The conservancy and scavenging have been carried out satisfactorily. Dairies and bakeries have been regularly inspected.

Jaffna.

It may be said that the sanitation of this town is slowly improving. During the eighteen months' period more public latrines have been provided; cesspits are being filled up and closed, and the dry-earth conservancy extended. Private compounds are cleaner, the dairies are inspected and registered, and by-laws have been passed for regulating them.

The drainage is defective; a complete scheme for the removal of sewage is required. It is reported that paddy fields in the heart of the town are being converted into sites for dwelling-houses. The water supply is unsatisfactory, both as regards quality and quantity. The scavenging is satisfactorily performed. There were too many cases of small-pox, which was introduced from South India, but there was an absence of cholera, and very few cases of enteric fever.

Batticaloa.

The sanitary condition of this town is not satisfactory. Extensive low-lying areas of land in the town are covered with water for months, and there are very few masonry drains, and these are seldom flushed. The water supply is from wells, and therefore "suspicious." A scheme for a water supply is under consideration. The scavenging is fairly satisfactory. Conservancy is carried out by the bucket system in a very limited area. There are five public latrines; the excreta is buried on the western shore of the lake. Cesspits are numerous; the soil of private compounds and shores of the lake are polluted by the habits of the poorer inhabitants. There is overcrowding in the Moor quarter of the town. Laundries, bakeries, aerated water factories, slaughter-houses, and the public markets are under the Local Board and satisfactory. The milk supply is very defective. During the period of this report there were no cases of small-pox or cholera, and only seven cases of enteric fever. There is a fair number of cases of tuberculosis. The infant mortality is high.

Anuradhapura.

Some attempt was made at anti-malarial work by the clearing of low jungle in the town and the keeping clean of the banks of irrigation channels. Weekly inspections were made by the Acting Provincial Surgeon of bazaars and tenements. The water supply is unsatisfactory. A drainage scheme is under consideration. The hospital has been improved considerably, and mosquito-proof wards for males and females have been established. The conservancy of night soil is partially carried out. The scavenging has been carried out satisfactorily.

Kurunegala.

The water supply is still unsatisfactory. The new scheme for a better supply has not been arranged yet. Owing to a drought the present supply almost failed. A pumping plant to obtain water from the tank for flushing drains is being put up. Cesspits are being filled and closed and the dry-earth system adopted in their place. As mentioned under the heading of "Malaria" in an earlier part of this report, this town is the first in Ceylon in which active measures are being undertaken to combat the periodical outbreaks of malaria. The scavenging is satisfactorily carried out. The laundries, dairies, public latrines, and public markets are inspected regularly by the sanitary officer and are well kept. The drainage in many parts of the town consists of earth drains, and is therefore unsatisfactory. There is some overcrowding in parts of the town.

Badulla.

Cement concrete drains are replacing gradually the primitive type. The water supply is sufficient in quantity and of good quality. The scavenging is done satisfactorily, and there is a partial dry-earth conservancy. Some overcrowding exists. There are no dairies or laundries. The bakeries are kept in a good sanitary condition. This year the Provincial Surgeon, with the help of the Government Agent, has been very energetic in trying to reduce the outbreaks of malaria by the filling up of hollows, drainage, and the oiling of sheets of water, and free distribution of quinine. Like many other towns in Ceylon, Badulla possesses a large area of paddy fields, in which the malaria-bearing mosquito is found. It is difficult to "oil" paddy fields for two reasons: that the paddy stalks break up the film, and the water is running. Experiments carried out by the Director of the Royal Botanic Gardens at Peradeniya proved that the oil on the surface of paddy land water disappeared in twelve hours owing to the large amount of water used for irrigation. Paddy land in and near towns should be converted into dry land for some other kind of cultivation.

Ratnapura.

The water supply is insufficient, and ran dry during 1911. There was a serious outbreak of cholera. The drainage is defective; a part of the town and bazaar became water-logged. Overcrowding is common. Cesspits are being replaced by the dry-earth system. The number of public latrines is insufficient. The markets are kept in a satisfactory condition. The bakeries and eating-houses are not kept well. The pollution of the river is marked owing to galas, private houses, and the hospital, which drain into it. Scavenging is fairly satisfactory.

Section V.—General.

Medico-legal.

During the period under review the Government Analyst completed 421 reports; 1,064 samples were examined in connection with them. The total number of judicial cases was 285, involving the examination of 745 productions. There were 127 cases of suspected poisoning. 122 samples of medicines were sent by the courts for reports. Besides criminal productions, a hundred samples were reported upon for various Departments of Government.

Administrative: Hospitals, Asylums, and Dispensaries.

The various medical institutions have been well maintained, and many structural improvements have been carried out, notably fly-proofing of kitchens and latrines and the mosquito-proofing of wards for malarial cases and of operating rooms. The building of a new out-patient department in connection with the General Hospital was commenced in September, 1909, and is now nearly finished. There were 73 hospitals and the lunatic and leper asylums, 408 Government dispensaries, and 250 estate dispensaries in working.

The following hospitals were opened during the eighteen months' period: The Lady Ridgeway Memorial for children, which contains 47 beds, and is worked under the administration of the Lady Havelock Hospital for children. A new Government hospital of 50 beds was erected at Muppane. New dispensaries were built at Nochchiyagama, Nanu-oya, Galawela, Wattegama, and Wellawaya, and one at Delft commenced. The new Government hospital at Koslanda is nearing completion. Several other new hospitals are in contemplation, for which sites are being selected and plans prepared.

Nursing in Ceylon Hospitals.

The nursing in Ceylon hospitals is undertaken by fully qualified European trained nurses, by religious sisters, and locally trained Ceylonese young women. There are 20 European trained matrons and sisters, 36 religious sisters, 29 locally trained matrons, 36 locally trained nurses, and 35 pupils in training.

The European trained matrons and sisters are employed mostly at the General Hospital, Colombo, and in the Kandy hospital. The religious sisters are employed in the native wards of the General Hospital and at Kurunegala hospital. Two nursing schools for the training of local pupil nurses exist at the Lady Havelock Hospital (Miss Richardson, matron) and at the Kandy hospital (Miss Hair, matron). The training course is for two years, at the end of which time certificates are given to those who pass the examination. More nurses are required; hitherto the inducements offered to candidates have not been sufficiently attractive. His Excellency the Governor appointed a Committee to inquire into the nursing of Ceylon hospitals and to report. The latter is now under the consideration of Government. The nurses are assisted in the wards by male and female native attendants.

Number of In-patients treated.

The total number of in-patients treated in all the hospitals and asylums of the Island was 118,024. The deaths were 12,840, giving a death-rate per cent. of 10·88 of the hospital population.

Number of Out-patients treated.

At the 408 Government dispensaries 218,645 new cases were treated, who paid 3,183,567 visits.

Surgical Operations.

Four thousand five hundred and two operations in general surgery were performed in all the hospitals, with 155 deaths, a death-rate of 3·22 per cent. Operations on the eye, not included in the above, numbered 604 among out-patients and 509 among in-patients, total 1,113 (at the Victoria Memorial Eye Hospital).

General Hospital, Colombo.

On December 31, 1909, there were 416 patients left in hospital, 34 in the paying section and 382 in the pauper section. During the eighteen months under review 20,677 cases were admitted, making a total of 21,093 cases under treatment. Of the 20,677 new admissions, 1,180 were admitted to the paying section and 19,497 to the pauper section. Of the 21,093 cases under treatment, 18,604 were discharged, 1,904 died, and 585 remained in hospital on June 30, 1911. Of the 1,904 deaths, 89 occurred in the paying section and 1,815 in the pauper section. The percentage of deaths to cases treated was 9·26 per cent. (7·3 in the paying section and 9·13 in the pauper section). The daily average number in hospital was 471·71.

The maximum number of cases in hospital on any one day was 560 on June 8, 1911, in the pauper section, and 55 on August 7, 1910, in the paying section. The minimum number of cases was 313 on April 16, 1911, in the pauper section, and 28 on February 6, 1910, in the paying section.

During a large portion of the eighteen months' period there were more patients than beds in the non-paying section of this hospital. This overcrowding was seriously increased by having to accommodate the patients with chronic complaints from Ragama (owing to the cholera outbreak), which was not relieved until temporary cadjan wards were built for them in the hospital compound. Two thousand four hundred and fifty-two surgical operations were performed by the surgeons of the hospital (2,126 in the pauper section and 326 in the paying section), with a total mortality of 64, or 2·2 per cent. The percentage of deaths to total treated in the pauper section was 9·13, and in the paying section the percentage of deaths to total treated was 7·3.

The receipts in the pauper section amounted to Rs. 297·45, and the expenditure (not including upkeep of buildings, equipment, medical attendance, nursing, drugs, and surgical appliances) was Rs. 161,271. The receipts in the paying section were Rs. 113,293, and the expenditure (not including medical attendance, upkeep of buildings, nurses, drugs, and surgical material) was Rs. 72,120, showing a credit balance of Rs. 41,173.

Houses of Observation for Suspected Lunatics.

In addition to those admitted into the houses of observation at the Colombo Lunatic Asylum, the numbers admitted into these institutions at Kandy, Galle, and Jaffna were 57, 77, and 26 respectively.

De Soysa Lying-in Home.

The numbers treated in this institution go up each year. For the eighteen months' period 1,925 were admitted, of whom 57 died (2·9 per cent.). Of the deaths, 30 were due to accidents of childbirth; of the number admitted, 1,532 were before delivery, 59 after, and 334 before the commencement of labour.

The seriousness of labour cases complicated with anchylostomiasis is shown by the fact that 8 out of 12 cases died. The percentage of infantile mortality was 3·78. It is gratifying to note that 51 patients were Mohammedans.

In addition to its useful work in rendering skilled aid to poor females during their confinements, this institution is doing good work in training midwives for practice in all parts of the island. The accommodation for these pupils is limited, and the course of instruction is too short, but no improvement can be made until more ground is available for building purposes. The popularity of the establishment is acknowledged, but its usefulness as regards its primary object and for the training of midwives has reached its limit unless more accommodation is provided.

The Lady Havelock Hospital for Women and the Lady Ridgeway Block for Children.

Mrs. Fysh, M.B., was in charge of the above institutions until September, 1910, when she went on leave, and was subsequently invalided. She was relieved by Miss de Boer, L.R.C.P. & S., who acted as Medical Officer in charge until the present Medical Officer was appointed (Miss Anderson, M.B.). The number of patients attending at the outdoor dispensary (in association with the Lady Havelock Hospital) was 38,925. During the period under review 1,508 patients were admitted into the Lady Havelock Hospital, with a death-rate of 6·42 per cent. The number of Mohammedans treated was 52. There were 122 surgical operations performed, with 9 deaths.

The Lady Ridgeway Block was opened in September, 1910, and from that date to June 30, 1911, 585 children were admitted, of whom 102 died, a mortality of 17·43 per cent. This high death-rate is due to the fact that parents will not bring in the children early in the disease; often they are dying when admitted, and frequently cases are treated for weeks by vedaralas before seeking admission. This institution is very popular; the number of applicants seeking admission often exceed the number of vacant beds.

The Victoria Memorial Eye Hospital and Grenier Outdoor Dispensary.

At the dispensary 12,787 new cases (eye and ear) were treated, among which were 1,201 cases of injury. One hundred and ninety persons were examined as to their fitness for employment in Government Departments, *e.g.*, the railway. Six hundred and four operations were performed.

At the Victoria Memorial Eye Hospital 1,003 in-patients were treated. Five hundred and nine major operations were performed, 277 of which were for cataract; 3·24 of these were failures. To show the popularity of this institution, patients came from every Province in this island and from South India. The accommodation provided has been found insufficient, and a new male ward and an enlargement of the outdoor dispensary are pressing necessities. Owing to the generosity of Mr. Walter de Soysa, who has given Rs. 50,000 for the extension of buildings for the treatment of eye diseases in Colombo, Galle, and Kandy, a start will be made soon to supply these wants.

Police Hospital, Colombo.

The total number of patients was 1,276; of those 122 were gaol officers. Of those admitted 4 died, 1 each from dysentery, bronchitis, pneumonia, and pericarditis; only one case of enteric fever was admitted. The average daily sick in hospital was 14·72.

Branch Hospitals for Women.

At Colombo 545 were treated for venereal diseases, with 1 death. At Galle 164 were treated.

Gaol Hospitals and Sick Prisoners.

During the eighteen months' period 21,749 prisoners were admitted into the different gaols of the island. The average daily strength of prisoners was 3,108·12; the number treated in gaol hospitals was 9,991. The total number of deaths was 347.

The chief causes of sickness and deaths were as follows: 3,984 cases of diarrhœa, with 133 deaths; 960 cases of dysentery, with 63 deaths; 1,213 cases of malaria, with 15 deaths; 18 cases of enteric fever, with 6 deaths; 144 cases of injury, with 2 deaths. All other diseases totalled 3,672, with 128 deaths.

Colombo Gaols.

	Average Daily Strength	Average Daily Sick	Total Deaths
Welikada	796·06	38·28	89
Mutwal	300·47	27·52	57
Hulftsdorp	121·08	2·45	6
Mahara	584·36	43·78	87

Diets.

In August, 1910, 16 oz. of raw rice was substituted for 16 oz. of bread in No. 1 penal diet in the Colombo prisons.

Kanatta Infectious Diseases Hospital.

One thousand six hundred and forty-six cases of infectious diseases were treated at the hospital during the eighteen months' period. The diseases included:—

	Cases	Deaths
Cholera	9	3
Small-pox	105	22
Chicken-pox	1,141	1
Measles	133	2
Acute diarrhœa	2	2
Mumps	73	—
Whooping cough	7	—
Beriberi	10	—
Diphtheria	4	1
Other cases, including those under observation	162	1

Victoria Home for Incurables.

At this institution 66 remained on December 31, 1909, and 12 were admitted during the period under review, making a total of 78 cases, of whom 1 was discharged and 3 died; 74 remained on June 30, 1911.

Bacteriological Institute and Clinic for Tropical Diseases.

The total number of specimens sent for bacteriological examination was over 3,000, including the Clinic and Seamen's Ward, General Hospital. The

fees collected amounted to Rs. 1,029. A new clinic is an urgent need, the present building being unsuitable. Research work was carried out in the following subjects by Dr. Castellani:—

(1) Dhoby itch and its fungi (five new species).
(2) The hyphomycetes of *Tinea imbricata:* their growth on artificial media and experimental reproduction of the disease.
(3) Tropical bronchomycosis.
(4) Anchylostomiasis fever.
(5) Cases of fever due to *Bacillus Asiaticus.*
(6) Observations on some new intestinal bacteria.
(7) A peculiar trichomycosis.
(8) The treatment of yaws.
(9) Vaccination with live vaccines.

Total Hospital Deaths.

The total deaths were 12,840. A statement showing the death-rate per cent. in the various hospitals and asylums (excluding the gaols) is given below, the death-rates among mixed races and immigrant Indians being shown separately:—

Hospitals	Mixed Races	Indians	Total
Civil	8·07	17·47	10·08
Field	4·62	11·54	5·55
Immigrant ..	3·65	2·45	3·24
District	7·75	19·87	16·18
Asylums	8·33	10·33	8·58
Other hospitals ..	·95	1·31	1·02
Total ..	7·46	17·98	10·88

Hospital Accommodation.

This was generally sufficient. Some of the hospitals in the planting districts were overcrowded. Water for drinking purposes is, as a rule, filtered before use. Separate bath-rooms are provided for males and females, but patients who can help themselves prefer to bathe in streams when such are near. The conservancy of the latrines is entirely on the dry-earth system.

Inspection.

The hospitals and dispensaries were regularly inspected by myself and the provincial surgeons of the respective Provinces. The number of these visits of inspection is given in the return of each institution. The books were produced when called for, and generally were found complete and kept up to date.

Food Supply.

The provisions for the various hospitals were supplied by contractors approved by Government. The system works satisfactorily. The food is inspected by the medical officers of the hospitals before it is served to patients, and any samples not approved are rejected. Contractors offering inferior samples are fined.

The Ragama Camp.

The total number of persons that passed through the camp during the period under review was 142,045; of these, 64,161 were from cholera-infected areas in South India, 6,244 from small-pox-infected districts, and 648 from plague-infected parts, and the others were Sepoys of the native infantry regiment stationed in Colombo, who returned from their homes in India. Forty-six thousand eight hundred and sixty-two persons were vaccinated at the camp.

The camp was free from infectious diseases till May, 1910. From May 5, 1910, to September 10, 1910, there were 11 cases of cholera, with 10 deaths, and 1 fatal case of acute diarrhœa. In 1911 there were 2 fatal cases of cholera and 1 case of acute diarrhœa up to May 1. A severe outbreak of cholera occurred in May, 1911, the first case being on May 3. The disease spread rapidly, and the total number of cases of the outbreak was 327, with 214 deaths. The outbreak lasted from May 3, 1911, to June 14, 1911. One case of small-pox only occurred at the camp during the eighteen months' period.

Medical College.

The College consists of lecture hall, students' library, laboratories for chemistry, physiology, pathology, and biology, a dissecting room, offices, photographic rooms, museum, the Colonial Medical Library, and a separate building for lady students. There were 243 students in attendance at the end of June last, of whom 161 were registered medical students and 82 apothecary students. Thirteen students qualified in medicine and surgery; 19 apothecary students passed out.

The work at the College and the number of students have outgrown the accommodation; the rebuilding of portions of the premises is sanctioned. The fees collected during the period amounted to Rs. 55,720, and the net cost of the institution to the Colony was Rs. 33,886·69. The net cost to the Government for the period for each student was about Rs. 139.

The Medical Council.

Meetings were held regularly. Thirty-five persons were registered.

The Civil Medical Stores.

The total cost of drugs, chemicals, and instruments during the period was Rs. 305,888·19; 140,592 oz. of quinine were issued, which cost Rs. 93,133. The cost of repairing surgical instruments was Rs. 919·54. The cost of transport was Rs. 10,620·07. The sale of medicines to Government Departments and others was to the value of Rs. 4,656·71, and the sale of medicines, &c., to estates realized Rs. 3,279·19. The sale of unserviceable articles realized Rs. 718·22, and the value of instruments sold, lost, and paid for by officers of the Department amounted to Rs. 2,541·77. The total cost of drugs, instruments, stationery, printing and binding, transport, and other incidental expenses amounted to Rs. 341,893·15, and the total income realized by sale of drugs, unserviceable articles, &c., amounted to Rs. 11,195·89.

Strength of the Medical Department.

The following was the strength of the Medical Department during the period: 1 Principal Civil Medical Officer, 1 Assistant Principal Civil Medical Officer, 1 Registrar of the Ceylon Medical College,

1 Director of the De Soysa Bacteriological Institute, 1 Assistant Bacteriologist, 1 Professor of Chemistry, 1 Professor of Physics, 1 Government Analyst, 9 Provincial Surgeons, 1 Superintendent of the General Hospital, Colombo, 1 Superintendent, Leper Asylum, Hendala, 1 Superintendent, Lunatic Asylum, Colombo, 3 Medical Women, 30 Medical Officers, Grade I, including 1 Medical Woman; 37 Medical Officers, Grade II, including 1 Medical Woman; 66 Medical Officers, Grade III, including 1 Medical Woman, 6 Health Officers, 246 Apothecaries, 1 Chief Storekeeper, 9 Inspectors of Vaccination, and 131 Vaccinators.

ESTATES BRANCH.

During the period there were 2,132 estates scheduled to 35 districts, with 21 district hospitals and 29 dispensaries and 18 civil hospitals and dispensaries, to attend to the medical wants of which the following medical officers were employed: Medical officers First Grade, 4; medical officers Second Grade, 11; medical officers Third Grade, 19; and 68 apothecaries.

During the period 26,854 estate labourers were treated in the district hospitals and civil constituted district hospitals. Of these, 5,448 died—a death-rate of 20·29 per cent. Of the mixed races, 24,861 were treated, of whom 2,271 died—a death-rate of 9·13 per cent.

In the civil hospitals, worked partly as district hospitals, the death-rate of estate labourers was 21·31 per cent., whilst in the district hospitals it was 19·87 per cent. The highest death-rate (39·07) among the estate labourers occurred in the civil hospital at Ratnapura, and the lowest (6·35) in the field hospital at Alutnuwara. The admissions into the former were 1,464, and into the latter 173.

The total number of days the estate labourers stayed in hospital was 667,587, an average of 24·85 days each; of these, 413,812 were paid for by estates, the rest being charged to the fund. The total number of days the mixed races stayed in district and civil hospitals was 326,372, an average of 13·12 days.

The total number of estate labourers treated at the outdoor dispensaries was 111,575. The total number of estate labourers treated on estates was 59,237.

The total number of births reported from estates was 26,553, of which 12,942 were males, 12,455 were females, and 1,156 were stillbirths.

The number of deaths reported from estates was 21,258, of whom 10,264 were males, 10,987 were females, and in 7 cases the sex was not stated.

Medical Aid.

The expenditure under the Medical Aid Ordinance amounted to Rs. 1,084,927·42, and the receipts to Rs. 611,633·48, leaving a deficit of Rs. 473,293·94.

APPENDIX.

The Opium Question.

The question of regulating the traffic in opium in this island is intimately associated with the name of Mr. John Ferguson, C.M.G. A Committee consisting of the Hon. Messrs. S. C. Obeyesekere, F. C. Loos, and J. Ferguson, C.M.G., and Mr. R. Morison, J.P., and the Principal Civil Medical Officer (Chairman), was appointed by Government in June, 1907, "to inquire into and report on the importation, sale, and consumption of opium in Ceylon, and to state what changes were desirable in the Ordinances and regulations affecting the importation and sale of the drug." The recommendations of that Committee were—

(*a*) That the present system of renting and licensing be abandoned.

(*b*) That all opium shops be closed on the expiration of existing licences.

(*c*) That the importation, distribution, and sale of the crude drug be made a Government monopoly.

(*d*) That for every opium shop closed the nearest Government dispensary be made available for the distribution of the drug to all habitual adult users of the same who may come forward to register their names for a certain quantity to be periodically given out and paid for in cash, and that suitable remuneration be given to the dispensers for the extra work and responsibility thus cast upon them.

(*e*) That the use of the drug, except for medical purposes, should be entirely prohibited after a definite period.

(*f*) That a system of careful inspection be introduced by the appointment of special officers under the direction of the Principal Civil Medical Officer.

This was followed by the appointment of a Commission in September, 1909, consisting of the Hon. Messrs. L. W. Booth, S. C. Obeyesekere, W. G. van Dort, M.D., Drs. A. J. Chalmers and H. M. Fernando, and Solomon Seneviratne, Gate Mudaliyar, with the Hon. Mr. A. G. Lascelles, K.C. (Chairman), "to inquire into and report on the question of introducing a system of registration of vedaralas who deal in opium in this country; and in the event of their being registered, whether the opium supplied to them should be pure or mixed with aloes or some other drug." The recommendations of this Commission were—

(*a*) The registration of vedaralas should be entrusted to provincial boards consisting of the Government Agents as Chairmen and such other members as the Governor may appoint.

(*b*) Only such vedaralas should be registered as in the judgment of the Board have gone through a sufficient course of training, are of good character, and have an extensive and more than merely local practice.

(*c*) Similar boards, if thought desirable, might be appointed in revenue districts with the Assistant Government Agent as Chairman.

(*d*) In order to secure uniformity the Governor should fix the maximum number of registered vedaralas to be allowed for each province or revenue district. To enable the Governor to do this in the first instance each Government Agent, after the Board has received and considered applications for registration as vedaralas, should submit a report on the applications to the Governor.

(*e*) On the registration of a vedarala, the maximum amount of opium which he will be entitled to obtain annually, and the depôt from which the opium will be obtainable, should be recorded, no vedarala being entitled to obtain opium from any source except the depôt in connection with which he is registered. Precautions must, of course, be taken that no vedarala shall be registered at more than one depôt.

(*f*) With regard to the quantity of opium for which vedaralas should be registered, we think that the maximum should be fixed by the Governor from time to time. We believe that 8 oz. a year would be sufficient, if the Government Agent were empowered to authorize the issue of larger amounts for limited periods in special cases or in seasons when there is an outbreak of any sickness for the treatment of which opium is necessary.

(*g*) Opium should be issued only to the registered vedarala in person.

(*h*) The vedarala, when registered, should be required to pay a registration fee to cover the cost of administration, and to enter into security to issue opium only for medicinal purposes.

(*i*) The Government Agents should have power to cancel registrations, subject to an appeal to the Governor.

(*j*) The price at which opium will be issued from the Government depôt should be fixed from time to time by the Governor, and opium should be issued only against cash payment.

(*k*) Subordinate provisions would be required as regards the issue of certificates of registration, notification of change of residence, the books to be kept, and other matters of detail.

The result of these two inquiries was the passing of an enactment cited as "The Opium Ordinance, 1910," in which opium was made a Government monopoly, with Government opium depôts in various parts of this island for the distribution of the drug to registered consumers and registered vedaralas. The Principal Civil Medical Officer was appointed to control and supervise this new branch of the Medical Department. Existing Government dispensaries were utilized for the majority of the depôts; in certain places, notably Colombo, houses were rented for this purpose. Fifty-eight opium depôts were established and equipped for the sale of opium by October 1, 1910, since which date the work has gone along smoothly. At the very busy depôts specially trained sellers have been appointed. A staff of examining clerks visit the depôts regularly and inspect the books.

Statement of Opium sold and the amount realized during the year October 1, 1910, to September 30, 1911:—

During the Four Quarters ended	Eating Opium		Smoking Opium		Total realized
	Quantity sold	Amount realized	Quantity sold	Amount realized	
	Grains	Rs. c.	Grains	Rs. c.	Rs. c.
December 31, 1910 ..	13,343,433	100,960 71	2,994,398	29,977 34	130,938 5
March 31, 1911	14,893,067	112,084 99	3,147,031	31,456 26	143,541 25
June 30, 1911 ..	15,932,828	119,781 17	3,040,191	30,405 99	150,187 16
September 30, 1911 ..	16,567,231	124,453 53	3,024,954	30,256 81	154,710 34
Total for the year ..	60,736,559	457,280 40	12,206,574	122,096 40	579,376 80

Colonial Medical Reports.—No. 31.—Jamaica.

MEDICAL REPORT FOR THE YEAR 1912.

By J. E. KER.

Superintending Medical Officer.

Quarantine.

During the twelve months ended March 31, 1912 there were no detentions at the quarantine station.

The following ports continued under proclamation as infected places during the twelve months: all ports of Brazil, for small-pox and yellow fever, dated February 6, 1892; all ports of Venezuela, for small-pox, dated September 29, 1898, and Mazattan in Mexico, for plague, dated May 26, 1903.

Trinidad was under proclamation as a place infected with plague for a portion of the year, sporadic cases having occurred at that place.

Modified quarantine restrictions were also imposed on ships arriving from New York in consequence of cholera having been imported there from Italy.

Plague at Port Durban, South Africa, and cerebro-spinal meningitis at Galveston have necessitated the detention of arrivals from these ports for report to the Quarantine Board.

No new works were carried out during the year at the quarantine station.

Repairs were effected to the valve of the large circular tank, the telephone, the wire gauze windows of the hospital and the flag-staff.

A large area of ground of about five acres in extent, and immediately adjoining the southern boundary of the quarantine station, was closely

cropped of dense trees and bush. This has had the effect of producing a large open space devoid of bush and trees amongst which mosquitoes might harbour.

This clearing, having gone through the dense tangle on the sea-shore, has practically cut off the access of mosquitoes from this bush and the lagoon to the quarantine station.

In January after a fall of rain a few larvæ of mosquitoes were observed in the lagoon. Minnows from the reserve tank were put in the pond and quickly dispersed.

A large bucketful of the water from the lagoon was taken to the quarantine station and six lively minnows put in with a view to ascertaining how long the minnows would live in it, and to gain some information as to the utility of the minnows in the destruction of mosquito larvæ in such a medium.

At the end of two hours all the fish in the bucket were dead.

These put in the lagoon were not seen again; but the mosquito breeding that took place was very limited since no trace of them could be found a week later.

The remarks of the Quarantine Board in last year's report with regard to the necessity of having an up-to-date Clayton disinfector on a barge or lighter, with a launch for towing, apply with unabated force. No confidence can be placed in the present methods of disinfecting the holds of ships with the antiquated sulphur pot. The approaching opening of the Panama Canal renders it imperative that some more efficient and trustworthy means of disinfection should be available.

Should the Canal bring no increased trade in the shape of ships and cargoes it will also, to a certainty, expose us to additional risks of the introduction of diseases into the Island.

D. Neish, Health Officer.

St. Elizabeth.

Since taking up the duties of Medical Officer of Health for the Parish of St. Elizabeth on April 1, 1911, and up to March 31, 1912, I have visited regularly the towns of the parish and a great portion of the country districts. The only infective disease which occurred during that period is enteric fever, of which a slight outbreak took place in the district of Santa Cruz: there were four cases and the disease did not spread. There were a few sporadic cases in Southfield district but not of an epidemic form.

I have found during the past five years that in every period of drought the people in these parts drink any and every kind of water owing to the scarcity of this article, and they have not yet learnt the absolute necessity of boiling the water for drinking purposes, and it is at this time that such cases occur. There was during the fall of the year under review the usual malaria fever, but this was of a milder type than in other years, and not so extensive, consequent on the severe drought and absence of stagnant water.

The houses and their compounds have never before the appointment of a Medical Officer of Health been regularly inspected and consequently were, among the poorer classes especially, not in a sanitary condition, but since the putting into operation of the Health Law and by regular inspections and personal explanations the people are beginning to recognize that their premises must be kept sanitary; this of course takes time, and I would be averse to taking legal proceedings against them except in cases which show no attempt to carry out the orders of the Local Board of Health.

Water.—The water supply of the parish may be divided into two main divisions, viz.:—

(*a*) That portion of the parish which is supplied by springs and streams tributary to the Black River, the hills joining the watershed of this river. This portion comprises the north-eastern and central divisions of the parish, and has as a rule a copious and sufficient rainfall, and the people have a fairly good water supply.

(*b*) The drought area or south-eastern end, the western and northern parts with a large population dependent entirely on wells in the lowlands and on tanks in the hills, these tanks being quite insufficient and in a number of cases insanitary; the catchment of these latter being generally the yards around the houses. In the south-eastern end of the parish the people do not seem to have taken advantage of the Tank Loan Law which was passed recently for their benefit. There are two public tanks in this end of the parish, but they are quite inadequate to meet the requirements of the population. The Balaclava supply in dry weather is from the Oxford River, and owing to pollution the Local Board of Health has recently proclaimed this stream a source of public water supply. This course will doubtless cause a cessation of the pollution. The town of Black River is supplied by efficient and pure water by means of service pipes.

The refuse of the town of Black River is used for filling and reclaiming swamp-lands; in other places it is carried out of the villages and used as manure by neighbouring landowners.

The latrine system in Black River is either directly into the sea by those householders along the beach or dry earth closets in other portions of the town; the duty of the sanitary officer is to see that these latrines are emptied at least twice a week and the excreta thrown into the sea. In other parts of the parish the general system is that of earth pits or open-air closets which are hardly sanitary, and it will take some time to educate people into the dry earth closets system, but already there are signs of improvement.

The housing of the poor in towns and villages is fairly satisfactory, but there are several dilapidated shanties in the villages which will have to be condemned during the coming year. In the country parts the housing is often deplorable, the small houses being badly built with no flooring, only clay rammed, and as many as five or six people sleeping in one small room with very little ventilation; the consequence is that the health of these people suffer, especially during the wet seasons.

Colonial Medical Reports.—No. 31.—Jamaica.—(*continued*).

There is no marked pulmonary tuberculosis in this parish, cases occasionally occurring in the hills among visitors who go there with this disease in search of climate.

The local conditions causing malaria are the usual ones in a tropical country, and after heavy rains all the holes and depressions retain water which form breeding places for mosquito. This parish having about one-third of its area almost at sea-level (and in swamp) it is extremely difficult to deal with this condition, but by the example of the Malaria Commission in filling up a large morass near the town of Black River, there are indications of the local owners following this good example, and in the next year the improvement will be more general as the Local Board of Health is insisting on these improvements.

The Medical Officer of Health visits as a routine the towns and villages which have been declared places under Law 35 of 1910 at least once a month, and there are three sanitary inspectors appointed by the Local Board of Health who report regularly to that officer on the local conditions of their respective districts. In Black River, where the Medical Officer of Health resides, the inspection is daily by the sanitary officer and the Medical Officer of Health.

There has been considerable new work done in the interest of sanitation during the year, notably the reconstruction of all the stalls in the markets at Black River and Balaclava, the old insanitary wooden stalls being replaced by concrete slabs, a new drainage system laid down in each of these markets. Extensive concrete drains have also been laid throughout the town of Black River.

A. R. Todd, M.O.H.

Trelawny.

The sanitary conditions are on the whole satisfactory, although there still remain many conditions open to improvements, such as removal of konch shells and empty vessels liable to contain stagnant water from compounds. Also proper drainage of streets to carry off waste water and regular attention to keep such drains clear of rubbish.

Water Supply.—The town of Falmouth is supplied through pipes from the Martha Bræ River. Some villages are supplied by ponds and others situated near the river receive their water therefrom. There is no adequate means of protection from water pollution.

In the town of Falmouth the sanitary carts remove house refuse. The pit closets exist in most houses. In so far as I am aware overcrowding does not exist. The poor are well housed.

Tuberculosis.—Pulmonary tuberculosis is not very prevalent in this district; there are, however, a few cases.

The swamps and ponds in Falmouth do not in my experience breed malaria mosquitoes although the mangrove trees may act as shelters for the mosquito.

Dr. A. E. C. Myers.

Duncans.

There has been a change for the better here. People are beginning to appreciate the benefits of a clean house and yard.

Water supplies are from ponds in the neighbouring villages. There is no way of preventing pollution.

Disposal of Refuse Matter.—This is a matter that requires the urgent attention of the parochial authorities—there are no dumping grounds anywhere, and these are absolutely necessary. Until the local authorities move in this matter I consider it is useless and unfair to prosecute private individuals for not keeping their yards clean.

F. A. G. Purchas, M.O.H.

Ulster Spring.

The health of the district has been good during the past year. There have been regular inspections as to the keeping and cleaning of latrines. Latrines are not properly kept, sufficient dry earth is not thrown on the excreta, in the majority of cases no steps are taken to throw any earth at all. In another set of cases no arrangements are made for any latrines; this was so in the house in which there was the only case of enteric fever in this district this year.

The houses and compounds are in fairly good condition. One must remember that the term "hut" would more justly be applied to the majority of the buildings not in the immediate vicinity of villages, and these are most badly built and poorly ventilated.

Cases of malaria fever and pulmonary phthisis are few and far between.

Dr. Smith.

Westmorland.

The sanitary condition of houses and their compounds are in a fair condition. By following the advice of the sanitary officers, the use of disinfectants, and the observance of sanitary measures hitherto neglected, improvements have taken place.

Sav.-la-Mar is supplied with water from Sweet River, a distance of about six miles from the town. A main is laid in the intake and the water is

conducted through this main to the town; service pipes are attached to the main and connected to each house in the water area, for which a rate is charged and collected.

The sanitary inspectors visit the public water supplies regularly, and see that no pollution takes place and that the surroundings are kept in a sanitary condition. I have just recommended to the Board that springs and wells be covered as a protection from pollution.

In town the yards and streets are swept daily by scavengers, and the refuse carted away and deposited at the depôt ground some distance from the town. In the villages each occupier keeps his compound clean, to the satisfaction of the sanitary inspectors.

Latrine.—The " pit system " is in general use in town. At the public institutions the dry earth system is in force. The villages have no particular system but sanitation is enforced by the sanitary officers.

Malaria—the presence of several breeding places of mosquitoes—stagnant water, swamps, the want of concrete drains and other insanitary conditions. These causes are receiving the attention of the Parochial Board, and I do most earnestly solicit from the Malaria Commission a grant to enable the Board to carry through these important measures.

No prosecutions for non-compliance with the Health Law have taken place as the people really carry out the orders of the sanitary officers, more especially in the country districts.

H. Robins, M.O.H.

St. Thomas.

The overcrowding of houses among the poorer classes is very common, but the necessity of keeping their compounds clean is being appreciated to a marked degree.

The water supply of Morant Bay is good, but a great deal of hardship is felt among certain villages, Duckenfield, Dalvey and Bowden, especially during severe droughts. An epidemic of dysentery occurred last month at Duckenfield, due to impure water supply, resulting in one death. The majority of these districts abound in springs, and their protection from contamination by solid concrete enclosures is most urgently needed.

A house-to-house daily disposal of refuse is rigidly carried out in Morant Bay, and is used to fill up the Board's swampy lands; the collection and burning of refuse being taught to the inhabitants of the country districts.

The latrines in and around the town and villages lack modern improvements for the benefit of sanitation. There are signs of improving them, and new ones are only built from specifications submitted to and approved by the Medical Officer of Health.

Pulmonary tuberculosis shows an increase in the number of cases, but the majority of cases coming under my notice seem to contract the disease in Central America and other parts, and come here with it.

Malaria fever is less prevalent than it has ever been. There is always, however, a number of cases to be found in the P. G. River district during the year, and if this district is made a sanitary district under charge of an inspector of nuisances a great improvement will result. The Bamboo River in Morant Bay is the chief source of the breeding of anophelines.

Daily inspections are made by the Medical Officer of Health and the Inspector of Nuisances around the town of Morant Bay, and the Medical Officer of Health also visits the different sanitary districts at least once a month.

Many works for the improvement of sanitation have been done by the Board, including the extension of concrete drains around the town of Morant Bay and Church Corner; the concrete drain at Brown's Gully, which however is not yet finished, the establishment of a market at Port Morant, which has been the means of cleaning and filling up some of the swampy lands, an absorption pit at the Alms House with concrete drains around the compounds of the institution. The intelligent execution of the sanitary laws has given satisfactory results.

F. A. Norton, M.O.H.

St. Mary.

Before a regular and systematic inspection of the houses and compounds was made, most of the houses and yards in the town were in a highly insanitary condition. Water was allowed to collect, broken bottles filled the yards, and the latrines were never emptied. But these conditions are ceasing to exist.

The water supply of Port Maria is excellent, and it is proposed to shortly carry the water by pipes into Oracabessa and the surrounding districts.

The disposal of refuse, &c., is a matter that is attracting the attention of the Parochial Board. At present there is no deposit ground, and until a suitable place is found this difficulty will always exist. At present an attempt is being made to throw all the rubbish, &c., into Warner's Pond with the idea of gradually filling it up. This has worked very satisfactorily.

Until the appointment of a Medical Officer of

Return of Diseases and Deaths in 1911-12 in the various Hospitals of Jamaica.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases treated
Alcoholism	2	—	2
Anæmia	327	7	327
Anthrax	—	—	—
Beriberi	10	—	10
Bilharziosis	—	—	—
Blackwater Fever	4	—	4
Chicken pox	1	—	1
Cholera	4	—	4
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	104	9	104
Delirium Tremens	1	—	1
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	186	10	186
Enteric Fever	164	40	164
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	434	—	434
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	3	—	3
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	2	—	2
(*b*) Anæsthetic	1	—	1
(*c*) Mixed	—	—	—
Malarial Fever	1	—	1
(*a*) Intermittent	7434	37	7434
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	327	21	327
(*c*) Pernicious	87	11	87
(*d*) Malarial Cachexia	15	1	15
Malta Fever	1	—	1
Measles	1	—	1
Mumps	5	—	5
New Growths	—	—	—
Non-malignant	83	1	83
Malignant	63	9	63
Old Age	—	—	—
Other Diseases	114	2	114
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	4	—	4
Rachitis	—	—	—
Rheumatic Fever	3	—	3
Rheumatism	1528	—	1528
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	19	14	19
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	—	—	—
(*a*) Primary	278	1	278
(*b*) Secondary	168	2	168
(*c*) Tertiary	181	3	181
(*d*) Congenital	61	3	61
Tetanus	14	10	14
Trypanosoma Fever	—	—	—
Tubercle	68	15	68
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	1	—	1
Yaws	255	1	255
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases treated
Diseases of the –			
Cellular Tissue	611	5	611
Circulatory System	665	23	665
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System	1844	75	1844
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	77	—	77
Eye	308	—	308
Generative System	—	—	—
Male Organs	271	5	271
Female Organs	257	5	257
Lymphatic System	216	3	216
Mental Diseases	23	—	23
Nervous System	451	8	451
Nose	5	—	5
Organs of Locomotion	251	4	251
Respiratory System	—	—	—
Skin	4111	8	4111
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	324	49	324
Injuries, General, Local	1800	39	1800
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other injuries	—	—	—
Parasites	24	—	24
Ascaris lumbricoides	9	—	9
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	470	7	470
Filaria medinensis (Guinea-worm)	7	—	7
Tapeworm	—	—	—
Poisons	5	1	5
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations	2268	20	2268
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Health all the latrines in the vicinity of the Outram emptied into the river. I went up one morning in a boat, and was appalled at the existing circumstances. Since then I have had all the latrines removed from the river and a dry earth system is now in vogue, but until a deposit ground is chosen and the night soil removed by a proper cart service, I am much afraid that a nuisance will still exist.

Overcrowding exists in Port Maria, which I suppose is common in nearly all towns in Jamaica. The yards are being kept more clean, and owing to the benevolence of the Government, who supply quinine cheaply to the inhabitants, malarial fever is certainly diminishing.

Inspections are made daily, and in special cases yards are visited more frequently, especially in the case of those who seem disinclined to keep their places clean.

W. G. Farquharson, M.O.H.

Gayle.

The sanitary condition of the houses and their compounds leave much to be desired indeed; in many districts the conditions are such as appertain to man in a primitive state.

There has been some improvement in the villages, as householders are now compelled to keep their yards clean and abate all nuisances under the new Health Law. But as this district is a very populous one and made up of numerous small settlements, the sanitary improvements in the chief village merely touch the fringe and can only be regarded as a first step, but it is to be hoped that the example of the larger centres and the increasing popular demand for sanitation will compel the remoter settlements to fall in line.

With the exception of a few better class residences which are supplied by tanks, rains, &c., the water supply of the whole district is the simple one of direct collection from rivers and springs, which are numerous and never-ending.

In the case of the springs, while the water is no doubt pure, it is frequently contaminated by the washing from the houses above, by the watering of stock, by water carriers' feet, and other obvious sources of pollution. The water is collected chiefly by children at dusk or in the early morning, and the condition of the pools at such times can better be imagined than described. Since my appointment as Medical Officer of Health of this district I have brought this matter to the notice of the Parochial Board, and have suggested the erection of small impounding dams with supply pipes. I am glad to say that estimates of cost have been prepared and submitted for the Saltrum, Derry, Mount Angus and Windsor Castle springs, and it is evidently intended to proceed with these as soon as the necessary rights have been acquired.

There are no special means for the disposal of refuse waste or objectionable matter. These are usually deposited in the nearest banana field or other convenient spot and time, and our natural scavenger—the "John Crow"—does the rest.

The pit closet is the only attempt at a latrine system in the villages. In some of the better-class houses and in Government institutions (*e.g.*, police stations) the dry earth closet is used. For the district generally the latrine system is that described under disposal of refuse, *i.e.*, the banana fields. This may have some agricultural benefits to commend it, but it is certainly objectionable, and in my opinion is responsible for many intestinal disorders among the people, and for the small outbreaks of enteric fever which occur from time to time in this district.

Among the facts brought out by the last Census was the great increase in the number of good houses in this parish, and to this end I think this district has added its fair share. It is certainly refreshing in certain parts to see the neat little cottages that have recently been and are still being erected. When one considers, too, the high price of lumber and other building materials in these parts, this is certainly commendable, and is sure to confer other benefits as well as those of sanitation. Unfortunately, there are many settlements which are little better than African villages, with the associated insanitary conditions. Overcrowding exists to a great extent in these settlements, yaws and other loathsome diseases abound, and the general health and intelligence of the people are low. That they live at all can only be explained by the naturally salubrious climate, the high infantile mortality which ensures the survival of the fittest and the powerful immunity acquired against many of the ordinary diseases.

Pulmonary tuberculosis is not prevalent, and, strange to say, very few are seen from those districts where overcrowding exists.

This district is a very hilly one, and there are few natural conditions favouring the propagation of the mosquito. There are, however, some stagnant pools in and around Gayle in which anopheline larvæ have been observed by me. These may well be drained.

G. Lecesne, M.O.H.

Richmond.

There has been a marked general improvement throughout this district in recent years in the

structure and accommodation of the houses, and this tends towards better sanitation.

The whole district depends for its water supply on the streams and rivers, in some places on tanks and ponds, and in a few instances on wells. No means are taken for protecting the water from pollution, except by the large proprietors who have the streams on their properties and under their direct control. There is an absolute disregard of all the laws passed for the prevention of fouling the various streams.

In Highgate and Richmond there is some attempt made to sweep up the refuse twice a week. In other parts of the district the refuse is simply allowed to accumulate or thrown in the nearest banana walk.

There are but few latrines provided in the villages of the district. Such latrines as exist are either pits or just built on a slope and exposed to the elements.

The poorer classes are fairly well housed, and there is no overcrowding in the usual sense.

Mosquito breeding places exist throughout the district, viz., ponds, badly graded banana trenches, the rank vegetation along the banks of most of the streams, &c. These are all, of course, possible sources of anopheles and, ergo, malaria.

P. O. MALABRE, M.O.H.

ANNOTTO BAY.

The houses of the poorer class are for the most part badly ventilated, and overcrowding exists in a great many instances. The compounds around some of the dwellings are insanitary and require cleaning, bushing, &c. Pulmonary tuberculosis is not very prevalent. In Annotto Bay, as far as I am aware, agriculture being the occupation of the labourers, their lives are spent mainly out of doors, which probably lessens their chances of infection.

The water supply for the town is laid on by pipes from house to house. The intake is high up in the Fort George Hills, and though there are no filter beds the water cannot easily be contaminated. The quality is excellent and the quantity ample. In some of the yards small puddles collect from the drippings from the taps, but on the whole nuisances from this source are not often noticeable.

The parochial carts remove some of the rubbish from the town and some is burnt in the yards, but it is necessary to provide a deposit ground for all refuse and waste matter.

There is no regular latrine system in the town; such as there is is in the main most insanitary, and the accommodation provided appears to be insufficient. The bucket system should be adopted, buckets being emptied regularly into the sea.

Malaria prevails throughout the district, but the cases coming under observation have not been so numerous during the past ten months, due no doubt to the prolonged drought, but the disease is always with us. There are large swamps in and around the town, and on my visits of inspection it has been quite easy to find the larvæ of malarial mosquitoes in abundance. The two swamps in the town known as the " Annotto River " and " Miss Fords River " should have permanent outlets to the sea. If such outlets were constructed and the water allowed to drain into the sea, the swampy lands in their neighbourhood would be considerably improved. The swamp known as " Miss Fords River " is the most prolific breeding place for anopheles mosquitoes in the town. The swamp has been somewhat improved, the banks are clean, and the water lilies on the surface removed.

F. A. RITCHIE, M.O.H.

PORTLAND—HOPE BAY.

From time to time inspections have been made of houses, compounds, &c.

Whilst there is still room for improvement, they have responded very well on the whole. The sanitary condition of houses and their compounds have shown distinct signs of improvement, the yards are kept clear of refuse and waste, and although in a few instances it was necessary to issue notices calling the attention of householders to their negligence, the matter was always promptly attended to, and no further steps taken to enforce the regulation.

The water supply of houses is obtained from springs generally, and in some instances from catchments of rain water in puncheons, &c. There is no protection for any of the springs, as the water is taken as it bubbles out of the rocks. The puncheons, &c., need constant supervision, as quite frequently some are found with stegomyia; these are promptly dealt with.

The disposal of refuse and waste and objectionable matter is carried out by dumping in pits dug for the purpose outside of the town, and properly covered up when necessary.

The latrine system is that of the earth closet, and they also require constant supervision and disinfection. In a few instances it was necessary to condemn the sites and have them removed to more suitable spots.

I am afraid there is always more or less overcrowding.

Pulmonary tuberculosis is not by any means prevalent; the percentage is very small.

The chief local condition causing malaria is a swamp on the Hope property, adjacent to the town

of Hope Bay, and connecting with the sea by a stream which is always stagnant, except in very heavy weather, when the mouth is opened into the sea.

Anopheles abound in this locality, and malaria is the most prevalent disease in this district. The banks of this stream are cleared from time to time of weeds, and the water lilies pulled up as much as possible, and both the banks and water oiled or disinfected. I may state here that at the police station, in spite of its cleanliness inside as well as around its immediate neighbourhood, and in spite of the regular dosing of the men with quinine, they all suffer a good deal from malaria, which I attribute to the quantities of mosquitoes which take refuge there, and the want of screens on doors and windows.

Not one man has escaped an attack of malaria during the past two years, and sometimes they are all on the sick list at the same time.

ARNOLD T. CLARKE, late M.O.H.

CLARENDON, CROFTS HILL, KELLETS.

The sanitary condition of the district is on the whole fair.

There were two cases of typhoid fever, both in December: one at Jincho and the other at Sevens Ground. The source of infection in the one at Jincho could not be ascertained with any certainty. In the case at Sevens Ground, another member of the family had died a short time before from what appears to have been ambulatory typhoid.

Strict attention was paid to the disinfection of all infectious material in the cases of typhoid fever, and no further cases occurred.

A bakery in connection with the house in which the case of typhoid fever occurred at Sevens Ground was shut down until all risk of infection from the patient was past.

H. T. STRUDWICK, M.O.H.

VACCINATION.

During the past year the vaccine lymph sent out from England proved for some months to be very inert, large numbers of children who were vaccinated failing to show successful results, much to the annoyance of medical officers and to the parents of the children.

The inactivity of the lymph seems to have been due partly to the extremely hot weather, and partly due to reinforcing the parent seed through a rabbit before cultivating it on the calf.

YAWS.

During the year under review a great deal more attention has been given to this disease than before. The Yaws Notification Law has given the medical officers increased facilities for dealing with and following up the treatment of cases seen in the bush, and consequently a possible chance of seeing some results of their work, a thing that in the days when only one visit was paid to a patient was absolutely impossible.

Yaws in many parishes of the island exists chiefly in mountainous localities and where water is scarce or not close at hand, and where cleanliness, bathing and proper sanitary precautions are negligible quantities, consequently treatment of this disease is a somewhat difficult matter.

Other infective diseases are segregated, and rightly so, and it consequently seems only right that this disease should be also isolated.

In view of the success already achieved by the use of salvarsan in the treatment of this disease, there is the hope that by taking cases of yaws into existing hospitals where there is room for them, or into specially made cheap hut hospitals, and using that drug, a speedy cure of local symptoms may take place, and a probable wiping out of the disease altogether, a thing that the present system can never lead to.

The total number of patients treated in public general hospitals during the year under review as compiled from the nosological returns submitted by the D. M. O.'s were: Cases, 26,091; deaths, 497; giving a death rate of 1,904. The number of operations performed were 2,268, with 20 deaths, showing a death rate of 882 per cent. Among the number of patients treated in the hospitals were the following: Patients admitted without charge, 7,395; indentured coolie labourers, 17,322; constables, 569; paying patients, 166.

HOOKWORM DISEASE.

A consistent and steady examination of short term prisoners admitted to the Spanish Town Prison since October 1, 1911, has been made by Dr. Peck, D.M.O., in medical charge of that institution.

As regards estates, I have no doubt that the degree of infection varies very much—some estates being doubtless more infected than others.

Coolies are known to import the disease with them and to suffer much from ankylostomiasis. In fact of the first eight coolies from the last batch landed and examined by Dr. Moseley at Port Antonio Hospital seven were found to harbour the worm.

Until recently, however, it has not been generally recognized that the creole is as badly infected as seems to be the case, and much of the supposed laziness and languor of the labouring classes is

without doubt due entirely to the fact that they are anæmic and debilitated owing to the fact that they harbour the hookworm.

It may also be a fact and probably is, that many cases of deaths registered as malaria or undefined fever are due to this parasite. It must be remembered that about 3,000 deaths annually occur from "undefined fever," nine-tenths of which are buried without a medical certificate.

It is a great pity that treatment of this disease cannot be systematically carried out on board the ships that convey coolies to the West Indies.

The number of worms passed in some of Dr. Peck's cases were very large—439 being counted in one case.

The total number of prisoners examined by Dr. Peck and his dispenser, Mr. DeLeon, was 428; of these 313 were found to harbour the disease, and in 115 no evidence of the worm's presence was found.

Owing to the above results of examination and the fact that many of the Northside coolies who are infected are now transferred to Spanish Town Hospital, it becomes a serious question as to whether the Penitentiary Farm should have the sewerage from the above institutions run on to it any longer.

Of the newly arrived immigrants that arrived recently on an estate Dr. Moseley found ova in fæces of seven of them.

Dr. Turton's Report.

Since he reported three years ago on the prevalence of ankylostomiasis in his district it has become increasingly evident to him that this disease is responsible for a far greater amount of disability—of chronic ill-health—among the labouring population of his side of the parish than any other single cause that he can name. It is the mild infection that seems to be so insidious in its effects before the grave and unmistakable symptoms show themselves. Over and over again within the last few years he has seen cases of chronic "debility" without any marked symptoms clear up and recover rapidly on the discovery of a very mild infection followed by specific treatment.

One occasionally sees a whole family affected in greater or less degree. He writes thus of the district as only being within his own knowledge.

But he may say that he has examined every child admitted into the Industrial school during the past year: these came from every parish in the Island, and it is a rare thing to find a child from any one of the country districts that is quite free from this infection. This is of course the result of the absence of any proper system of dealing with the excreta, the earth becoming foul, re-infection occurring, and the disease spreading. Then comes physical disability, and so poverty; from this to prædial larceny is but a step, and the children left to find for themselves become a curse to their neighbours by reason of the depredations—for they must steal or starve. So the vicious circle of poverty and disease becomes established, with crime as an incidental. His strong conviction is that this disease is responsible for much of the petty crime of the country districts of the Island.

Note on Ankylostomiasis in the Penitentiary.

The investigation into the prevalence of hookworm among prisoners received at the penitentiary has been continued during the year ended March 31, 1912. 232 new prisoners were examined. 167, or about 71 per cent., were found to contain hookworms. The naked-eye method of examination was employed, so that it is certain that many cases escaped detection; the more laborious microscopic or cultivation methods would have yielded a much larger percentage of infected cases. Coolie prisoners are not included in this investigation. Of the 167 infected cases 116 are recorded as having many worms; in the remainder only a few were found. Six cases were in the third or most advanced stage of the disease, a number showed symptoms of moderate infection. All cases improved greatly after treatment.

The infected prisoners practically all came from moist agricultural districts, some had worked in cane or banana fields.

M. Grabham.

Quinine Sale and Distribution.

A great increase in the quinine output has taken place this year. The system of selling quinine tablets in farthing packets at the post offices is developing and more of the 2·3 and 1-grain doses have been circulated than last year. Each tablet is wrapped in paper and put into an envelope and sent in hundreds to the General Post Office when requisitioned. The farthing envelope packets are marked as follows:—

(1) Medical Department, Jamaica. Quinine, gr. v. One dose for an adult. Price one farthing.

(2) Medical Department, Jamaica. One dose for child of 9 years and under 14. Price one farthing.

(3) Medical Department, Jamaica. Quinine. One dose for a child of 5 years and under 9.

(4) Medical Department, Jamaica. One dose for child under 5 years.

Salvarsan.

During the year the remedy known as "606" was supplied to various medical officers. The results have been eminently satisfactory, as is shown by the reports attached under the heading "Yaws," but the injections do not seem however to have the same consistently good and rapid effect on cases of syphilis as on yaws, perhaps to some extent due to the fact that the pain resulting from the injection, and which in some cases is occasionally severe, lasts for some time, so much so that patients refuse a second injection.

Dr. Joslen, in a communication dated March 27, states as follows:—

"I regret to say that patients object to the pain caused by the intramuscular injection of salvarsan so much that in some instances they refuse a second injection. Just recently I have had a case of extensive tertiary syphilitic disease of the vagina which improved to an astonishing degree after one injection; a month after I suggested a second injection, but the patient absolutely refused in spite of the marked improvement after the first injection."

Lunatic Asylum.

The year began with 1,169 inmates under treatment, and ended with 1,195, or an increase of 26. The total number under treatment was 1,439, whilst the daily average number was 1,183. The number of patients admitted was 268, or 138 men and 130 women; of these 24 were readmissions. Although the admissions were 56 fewer than last year, the total number under treatment was greater, which left a residuum of 26 to swell our annual increase. The number of patients discharged amounted to 150. Of these 144 were discharged recovered, five discharged relieved, and one not improved, two patients escaped, one was captured, and the other left the island assisted by his friends. The rate of recovery calculated on the number of admissions was 53·89 per cent. Forty men and fifty-one women, or a total of ninety-one died; of these one inmate committed suicide by strangulation in his cell, several patients admitted in a moribund condition died within a few hours or days of admission.

With the exception of slight recrudescence of pellagra among the female inmates the asylum has enjoyed the best of health, with a marked absence of malarial fever and gastro-intestinal diseases.

The death-rate of 7·6 per cent. on the average number resident is one of the lowest in the history of the institution.

Hereditary influence accounted for 75 of the admissions. There are indications the time is approaching for preventing those who have suffered from insanity or who have inherited insanity on both sides from marrying. For the sake of future generations drastic measures are advocated for the suppression of the unfit. Three admissions were attributed to ganja smoking, which confirms the opinion expressed by the Council of Evangelical Churches that ganja smoking is spreading among the natives of the island, and that proper steps should be taken to suppress the cultivation and sale of the plant.

All the buildings destroyed by the earthquake were restored during the year, and an additional ward for the accommodation of 100 female inmates built. This has given us entire relief from overcrowding, from which the asylum suffered for many years.

A rainfall of 15·71 in. for the twelve months was exceedingly small, and advantage was taken of the drought to clean the grounds and repair the fences, at the same time providing healthy occupation for the inmates in the open air.

Colonial Medical Reports.—No. 32.—British Guiana.

MEDICAL REPORT FOR THE YEAR 1910-1911.

By J. E. GODFREY.

Surgeon-General.

Public Medical Institutions.

Public Hospital, Georgetown.

This institution has accommodation for 291 males and 245 females; 11,059 patients were admitted during the year, and with the 452 patients remaining in hospital on April 1, 1910, make a total of 11,511 patients treated. The number of out-patients treated was 41,908. There were 1,348 deaths. This gives a death-rate of 11·7 per cent., of the total number treated. Of the total deaths 290 or 21·5 per cent. died within twenty-four hours and no less than 526 or 39 per cent. died within seventy-two hours of admission.

Every year the resident surgeon draws attention to the large number admitted in a dying condition. This year he reports: "A large number of these would have had a far better chance had they come earlier, and had the advantage of good nursing." He also refers especially to the high death-rate from pneumonia due to the delay in coming to hospital and says: "It is quite a common occurrence for cases to be admitted suffering from pneumonia of six days' standing."

The deaths amongst children under 5 years of age were 235 or 18·9 per cent. of the total deaths. This is very excessive and in commenting on it the resident surgeon remarks: "I cannot too strongly emphasize the fact that it is to a large extent due to malnutrition consequent on improper feeding." There were 492 births in the maternity ward.

During the year 128 lectures were given in connection with the nursing staff, and practical demonstrations held in the wards in connection with the various classes.

The following return shows the number of operations performed and the revenue derived therefrom: Number of operations (major), 872; revenue from paying patients, $8,874.55; revenue from operations, $280.00; miscellaneous receipts, $341.39.

Public Hospital, New Amsterdam.

This institution has accommodation for 96 males and 54 females.

There were 3,169 patients admitted and with 124 remaining on April 1, 1910, make a total of 3,293 patients treated. The number of out-patients treated was 22,739.

There were 422 deaths, which gives a death-rate of 12·8 per cent. of the cases treated. Of the total deaths, 64, or about 15 per cent., died within twenty-four hours of admission. There were 65 births in the Maternity Ward.

The training of nurses at this institution has, I regret to say, been suspended during the year, as no provision has been made for appointing a Superintendent of Nurses.

Public Hospital, Suddie.

This institution has accommodation for 54 males and 26 females. There were 1,258 patients admitted, and with 55 remaining on April 1, 1910, make a total of 1,313 patients treated. The number of out-patients treated was 4,567. There were 197 deaths, which gives a death-rate of 15 per cent. of the cases treated. Of the total deaths no less than 135 died within seventy-two hours of admission. There were 17 births, of which 4 were still-born.

Public Hospital, Bartica.

This institution has accommodation for 24 males and 11 females. There were 267 patients admitted, and with the 6 remaining on April 1, 1910, make a total of 273 treated. The number of out-patients treated during the year was 1,066. There were 31 deaths, which gives a death-rate of 11·3 per cent. of the cases treated. Of the total deaths 7 died within twenty-four hours of admission. There were 7 births during the year.

Public Hospital, Morawhanna, and Arakaka Ward.

The Hospital at Morawhanna has accommodation for 14 males and 11 females, and the Arakaka Ward for 12 males. There were 504 patients treated and 32 deaths, which gives a death-rate of 6·3 per cent. of the cases treated. Of the total deaths 5 died within forty-eight hours of admission. There were 2,924 out-patients treated.

Lunatic Asylum.

There were 460 males and 275 females in the Asylum on April 1, 1910. During the year 72 males and 78 females were admitted, 27 males and 29 females were discharged, and 36 males and 25 females died. The percentage of mortality on the total number of inmates was 6·8.

Return of Diseases and Deaths in 1910 in the Public Hospitals,

British Guiana.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	15	—	15
Anæmia	166	3	166
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	2	1	2
Chicken-pox	6	—	6
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	258	84	258
Delirium Tremens	1	—	1
Dengue	—	—	—
Diabetes Mellitus	6	2	6
Diabetes Insipidus	2	—	2
Diphtheria	6	5	6
Dysentery	514	98	514
Enteric Fever	70	25	70
Erysipelas	15	4	15
Febricula	4	—	4
Filariasis	—	—	—
Gonorrhœa	127	—	127
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	93	—	93
Kala-Azar	—	—	—
Leprosy	9	4	9
(*a*) Nodular	1	—	1
(*b*) Anæsthetic	20	—	20
(*c*) Mixed	—	—	—
Malarial Fever—	44	9	44
(*a*) Intermittent	1943	78	1943
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	56	3	56
(*c*) Pernicious	10	4	10
(*d*) Malarial Cachexia	9	2	9
Malta Fever	—	—	—
Measles	2	—	2
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	63	1	63
Malignant	71	13	71
Old Age	6	1	6
Other Diseases	12	2	12
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	12	12	12
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	297	—	297
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	58	56	58
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	30	2	30
(*a*) Primary	11	—	11
(*b*) Secondary	30	—	30
(*c*) Tertiary	176	11	176
(*d*) Congenital	29	8	29
Tetanus	16	11	16
Trypanosome Fever	—	—	—
Tubercle—	69	24	69
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	17	—	17
Yaws	28	—	28
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	813	33	813
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	97	16	97
(*b*) Other Diseases	298	79	298
Digestive System—	—	—	—
(*a*) Diarrhœa	594	95	594
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	25	3	25
Congestion of Liver	3	—	3
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	16	—	16
(*g*) Cirrhosis of Liver	62	23	62
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	991	126	991
Ear	24	—	24
Eye	326	—	326
Generative System—	—	—	—
Male Organs	557	8	557
Female Organs	1589	56	1589
Lymphatic System	206	2	206
Mental Diseases	134	1	134
Nervous System	343	63	343
Nose	17	—	17
Organs of Locomotion	247	1	247
Respiratory System	2099	632	2099
Skin—	—	—	—
(*a*) Scabies	61	—	61
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	15	—	15
(*f*) Other Diseases	729	3	729
Urinary System	946	249	946
Injuries, General, Local—	743	21	743
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	417	51	417
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	152	16	152
Tape-worm	—	—	—
Poisons—	25	2	25
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	6128	61	6128
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Leper Asylum.

On April 1, 1910, there were 287 males and 126 females in the Asylum. During the year 67 males and 29 females were admitted, and on March 31, 1911, there were 299 males and 123 females in the Asylum. There were 87 deaths, 57 males and 30 females. The percentage of mortality on total number of inmates was 16·2.

The buildings and grounds are in good order. The farm was kept in good order and produced:—

Plantains ...	34,916 lb.,	valued at	$349.16
Cassava ...	23,732 ,,	,,	237.32
Greens ...	487 ,,	,,	2.43
Sweet Potatoes	609 ,,	,,	6.09
Arrowroot ...	20½ ,,	,,	1.00
Coco-nut Oil ...	29 galls.	,,	25.26

The majority of the inmates keep their cottages and grounds neat and tidy. They are given small plots of ground, in which during their spare time they are allowed to grow vegetables, and these are either used by themselves or sold to the store for consumption within the Asylum.

PUBLIC DISPENSARIES.

Georgetown.

There are three dispensaries in the city with the following boundaries:—

No. 1 Dispensary at the Police Station, Broad Street. It includes the following wards: Charlestown, Werk-en-Rust and Wortmanville. Medical Officer, Dr. Edmonds.

No. 2 Dispensary at the Alms House. It includes the Lodge Village and the following wards: Stabroek, Robb's Town and Bourda. Medical Officer, Dr. Massiah.

No. 3 Dispensary at the Public Hospital. It includes the following wards: Cumingsburg, Albert Town, Queenstown and Kingston. Medical Officer, Dr. Wharton.

Country.

There are seven country dispensaries situated as follows:—

(1) *Demerara River.*—At Akyma.

(2) *Berbice River.*—At Ida Sabina.

(3) *Upper Pomeroon.*—District extends from the Tapacooma Lake to and inclusive of Urua. The dispenser resides at Pickersgill.

(4) *Lower Pomeroon.*—The district extends from but exclusive of Urua, to the mouth of the Pomeroon River, and includes the Wakapoa Creek and its tributaries. The dispenser resides at Marlborough.

(5) *Moruca River.*—The dispenser resides at Acqueero and the district extends from the mouth of the Moruca River up to Kamwatta, including all the tributaries and settlements. The dispensers in charge are provided with corials for the purpose of paying periodical visits to the different grants, homesteads, and missions.

(6) *Potaro.*—11½ miles from Potaro Landing and provided with six beds for the reception of urgent cases.

(7) *Albouystown.*

The following table shows the number of persons treated:—

Dispensary	Paying patients	Police patients	Paupers
No. 1	753	—	3,279
Albouystown ...	2,184	—	5,520
No. 2	610	—	4,868
No. 3	567	—	3,901
Demerara River ...	242	22	489
Berbice River ...	353	—	363
Upper Pomeroon ...	133	24	773
Lower Pomeroon ..	369	47	641
Moruca	13	—	1,221
Total	5,224	93	21,055

The following Missions were supplied with medicines free: Mallali, Chalk Hill, Sand Hills, Orealla, Saxacalli, Capoey Lake, Mukumuku; Bedes' Mission, Dalgin, Muritaro, Rupununi, Duffryn Mission, Cabacaburi Mission.

PRISON HOSPITALS.

The following table shows the number of prisoners admitted and the number of deaths in these hospitals during the year:—

Institution	Admitted to Hospital M.	F.	Died in Hospital M.
H.M.P. Settlement ...	126	—	2
Georgetown	135	15	1
New Amsterdam ...	27	10	—
Suddie	19	—	—
Total	307	25	3

ALMS HOUSE AND ORPHAN ASYLUM.

The medical care of the inmates of these institutions is under Dr. E. S. Massiah, a private medical practitioner, who is also in charge of No. 2 Dispensary, Georgetown. A large number of cases of chronic disease, not likely to benefit by further hospital treatment, are sent from the hospitals to the Alms House.

SUGAR ESTATES.

The hospitals at Skeldon, La Bonne Intention, Rose Hall, Melville, Diamond and Nismes were repaired and painted. The hospital at Springlands was practically rebuilt and new ranges for the accommodation of the immigrants were erected on many estates.

At the close of the year there were thirty-nine estates' hospitals with a total of 2,458 beds. Fifty-two thousand seven hundred and thirteen patients were treated in the estates' hospitals, being a decrease of 5,636 on the previous year. There were 1,357 deaths, as against 1,386 for the previous year, which gives a death-rate of 2·5 per cent. of the cases treated.

It is interesting to report that the decrease in the number of cases of infantile convulsions mentioned in my report for last year still continues. For the year 1910-1911 there were 138 cases and twenty-nine deaths, as against 195 cases and fifty-seven deaths for the year 1909-1910. This is, I am sure,

very largely due to the systematic distribution of quinine.

In 1909-1910 there were 1,563 fewer cases of malarial fever treated than in the previous year, and for the year 1910-1911 there were no less than 7,556 less than 1909-1910, which, I think, shows that the general improvements in sanitation and the adoption of anti-malarial measures on the estates are bearing fruit.

Vaccination.

Glycerinated lymph is imported for the use of the Public Vaccinators, to whom it is supplied free of charge. There were 1,935 successful vaccinations during the year.

Health of the Colony.

It is satisfactory to report that the colony has been free of any dangerous infectious or contagious diseases. The death-rate for the whole colony was 34·4 per 1,000 and the birth-rate 27·5.

The remarks of the Resident Surgeon of the Public Hospital, Georgetown, as to the excessive death-rate from pneumonia, on account of the delay in applying for admission, and among children under 5 years of age, due to malnutrition, are interesting as they reveal important factors in keeping up the high death-rate of the colony.

Infantile Mortality.

The mortality amongst children under 1 year, it is to be regretted, still continues far in excess of what it should be. In 1909 there were 1,872 deaths or 209 per 1,000, in 1910 there were 1,954 deaths, or 235 per 1,000. The mean rate for the past five years was 210 per 1,000.

Tuberculosis.

During the year tuberculosis was the cause of 6·8 per cent. of the total mortality of the colony, and in Georgetown 8·8 per cent.

The Society for the Prevention and Treatment of Tuberculosis has continued its good work during the year. I know, from being in close touch with the working of this Society, that the scope of its work is being gradually extended, but the want of funds stands in the way. Its operations have now been extended by the appointment of a "Lady Visitor" who visits the cases under treatment, gives advice as to the means to be taken to prevent the spread of infection to others, and endeavours to persuade those afflicted to take advantage of the tuberculosis ward at the Public Hospital, Georgetown.

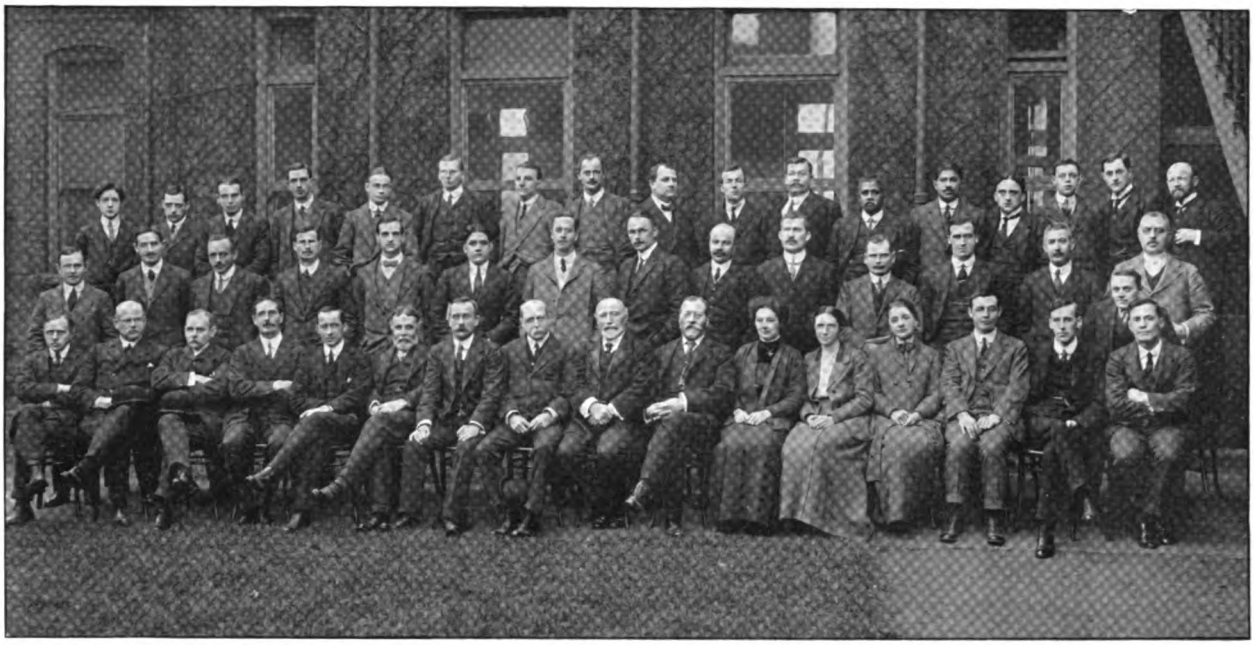
Leprosy.

A very interesting report on the treatment of leprosy by nastin at the Leper Asylum by Dr. Wise, Government Bacteriologist, and widely distributed, has been published. This report shows the great care and attention given to this treatment, and the enormous amount of work it involved, much of it being of a highly technical and scientific character. I cannot do better than reproduce it here.

"An important and highly interesting report by Dr. K. S. Wise, Government Bacteriologist of British Guiana, has recently been issued by the Colonial Office on the treatment of leprosy by nastin. The report gives the results of the extended trial of this remedy in the Public Leper Asylum at Mahaica during the period from December, 1908, to September, 1910. What makes the report more interesting is the fact that Professor Deycke, the originator of this treatment, visited British Guiana at the end of 1908 at the invitation of the Governor and with the approval of the Secretary of State for the Colonies, and remained in the colony for about six months in order that he might personally direct the method in which the treatment should be carried out. When he left his instructions were carefully observed and the treatment was maintained strictly on the lines he had indicated up to June, 1910, when experience suggested some modifications: among these was increase of the dose of nastin hypodermically injected; trial was also made of intramuscular injections, and single nodules were injected. In view of the apparent failure of nastin to cause any change or destruction in *Bacillus lepræ* in the nasal cavities or in the larynx weekly or bi-weekly sprayings by means of an all-glass nebulizer were adopted. Intractable ulcerations were treated with ointments containing benzoyl chloride in 2½ and 5 per cent. strengths. Finally benzoyl chloride in olive oil is now being used in some patients as an injection instead of nastin itself. These later methods have not been sufficiently long in use to warrant a report upon them being included in the present one, but it is hoped to give the results at a future date. So far as we know, although nastin has been tried by many experts in the treatment of leprosy, in no instance that we remember has the test been applied before on so large and extended a scale. The reports on the former trials of nastin have been somewhat conflicting, some experts asserting that marked improvement followed the use of the remedy, while others of equal standing reported unfavourably upon it, saying that it had no apparent effect upon the disease at all. Nastin, our readers are reminded, was introduced by Professor Deycke, a German medical officer in the service of the Turkish Government, and stationed in Asia Minor, where he had opportunities of studying leprosy and its treatment. Nastin is a fatty principle extracted from cultures of a streptothrix which Professor Deycke found in the nodules of lepers. It is combined with benzoyl chloride, and is made into ampoules with sterilized olive oil. It is now manufactured by a German firm of chemists at Biebrich, on the Rhine, for export. The action of this remedy is said to be effected by the nastin attaching itself to the leprosy bacillus, after which the benzoyl acts upon the bacillus, damaging it by the removal of its fat, when the normal fluids of the body complete its destruction. Nastin is used in three strengths—B0, B1, and B2, the last being the strongest. It was nastin B2 which was employed

LONDON SCHOOL OF TROPICAL MEDICINE.

44th Session. January—April, 1914.



Back Row.—D. Stocker (*Lab. Asst.*), D. S. O'Keeffe (Capt. I.M.S.), I. Ridge-Jones, G. G. Jolly (Capt. I.M.S.), A. L. Fitzmaurice, N. S. Williams, C. J. B. Pasley, S. Colyer, G. Warren (*Lab. Asst.*), E. Gibson, L. C. Brohier, J. J. S. Pillay, S. F. Chellappah, J. Marmion, W. McDonald (*Lab. Asst.*), N. E. Seppelt (*House Surgeon*), R. Wolfendale.

Middle Row.—F. W. O'Connor, (*Demonstrator*), F. E. Wilson (Capt. I.M.S.), G. M. Millar (Capt. I.M.S.), J. M. Stenhouse, C. Burnham, J. H. Castro, B. Haigh, A. Murphy (Maj. I.M.S.), V. St. John Croley, R. C. Lawrenz, P. B. Haig (Lt.-Col. I.M.S.), T. Ryan, R. O. Sibley (*Demonstrator*), C. E. F. Mouat-Biggs (*House Surgeon*).

Front Row.—B. H. Wedd (*Bacteriologist*), Dr. H. Williams (*Lecturer*), Col. A. Alcock (*Entomologist*), H. B. Newham (*Director*), Dr. G. C. Low (*Lecturer*), Dr. C. W. Daniels (*Lecturer*), Dr. D. Rees, P. Michelli, Esq., C.M.G. (*Secretary*), Mr. J. Cantlie (*Lecturer*), Comdr. G. Hodgkinson, R.N. (*Member of Committee*), Miss C. J. Crawford, Miss J. M. F. Drake, Miss E. N. Ross, C. M. Wenyon (*Protozoologist*), R. T. Leiper (*Helminthologist*), Robert (*Lab. Asst.*), Surg. E. L. Atkinson, R.N.

Absent.—A. L. Piper, I. M. Millar, A. Schokman, W. M. Wade, D. T. Mitchell.

LONDON SCHOOL OF TROPICAL MEDICINE

(UNIVERSITY OF LONDON),

Under the Auspices of His Majesty's Government,

CONNAUGHT ROAD, ALBERT DOCKS, E.

In connection with the Albert Dock Hospital of the SEAMEN'S HOSPITAL SOCIETY.

THE SEAMEN'S HOSPITAL SOCIETY was established in the year 1821 and incorporated in 1833, and from time to time has been enlarged and extended. It now consists of the Dreadnought Hospital, Greenwich, to which is attached the London School of Clinical Medicine; the Royal Victoria and Albert Docks Hospital; the East and West India Docks Dispensary; and the Gravesend Dispensary.

Over 30,000 Patients treated annually. Of this number many are Cases of Tropical Disease.

The School buildings are situated within the grounds of the Royal Victoria and Albert Docks Hospital.

MEDICAL STAFF OF THE HOSPITAL AND LECTURERS IN THE TROPICAL SCHOOL.

JAS. CANTLIE, Esq., M.B., F.R.C.S., D.P.H.
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Col. J. J. PRATT, I.M.S., F.R.C.S.
L. W. SAMBON, Esq., M.D.
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H. WILLIAMS, Esq., M.D., M.R.C.P., D.P.H.(Camb.

Dean—SIR F. LOVELL, C.M.G., LL.D. **Arthropodist**—Colonel A. ALCOCK, I.M.S., C.I.E., F.R.S.
Helminthologist—R. T. LEIPER, Esq., D.Sc., M.B., Ch.B., F.Z.S. **Protozoologist**—C. M. WENYON, Esq., M.B., B.S., B.Sc.
Director—H. B. NEWHAM, M.R.C.S., L.R.C.P., D.P.H., D.T.M. & H.(Camb.). **Secretary**—P. J. MICHELLI, Esq., C.M.G.

LECTURES AND DEMONSTRATIONS DAILY BY MEMBERS OF THE STAFF.

There are three Sessions yearly of three months each, October 1st, January 15th, and May 1st. A Course in Tropical Sanitation and Hygiene is held in the October and May Sessions. Women Graduates are received as Students.

Certificates are granted after Examination at the end of each Session, and the course is so arranged as to equip men for the D.T.M. Camb., the D.T.M. Eng., and the M.D. Lond., and by London University in Branch VI. (Tropical Medicine).

Fee for course £16 16s.; shorter periods by arrangement.

Students can be provided with Board and Residence, or partial Board, at the School.

Medical men requiring posts in the Tropics may apply to the Secretary at the School, where a Register is kept.

A syllabus, with the general course of study, can be had on application to the undersigned, from whom further information may be obtained.

Students of the London School of Tropical Medicine, who join the London School of Clinical Medicine, will be allowed an abatement on their fees and *vice versâ*.

Chief Office—SEAMEN'S HOSPITAL, GREENWICH, S.E.

throughout in British Guiana. The number of lepers treated by this remedy in the British Guiana Asylum during the period in question was 135, of whom 80 suffered from the nodular type of the disease, 24 from anæsthetic, and 31 mixed. There was no selection of cases for the nastin treatment; any leprous patient asking for it received it. Few of the cases could be regarded as early, or favourable, instances; only 3·7 per cent. had had the disease to their knowledge for less than two years. It is worthy of mention that the majority of the lepers who received the injections declared that the treatment produced 'a light feeling all over,' and as a result they were observed to work harder and more willingly on the farm or on their own garden plots. It is not possible to say how much of this tonic effect was due to the remedy or to the renewed hopes of a cure inspired by the injections. Dr. Wise, in summing up the results, says that those of less than eighteen months' duration improved considerably under the nastin treatment, so much so, that they might be regarded approximately as cured. But, on the other hand, some early cases got very much worse, though treated precisely in the same way as the others. It does not seem possible to foretell which course a given patient will follow under the treatment until it has been in progress for some time. The action of the nastin injections appeared to be that they initiated, accelerated, or intensified a natural process which usually occurs spontaneously in too small a degree or too late in the course of the disease to be of any benefit to the patient. It is claimed by Professor Deycke that nastin is capable of producing reactions of a general or local kind, the latter being confined to leprous tissue. On this point Dr. Wise says that his experience does not enable him to give a definite opinion; he admits, however, that such reaction does occur in some cases. There seem to be great variations in individual susceptibility and resistance. Probably in the majority of cases large initial doses are required to produce reaction; moreover, immunity to the action of the nastin seems to arise rapidly. As has already been pointed out, Professor Deycke claims that the injections cause definite changes to take place in the *B. lepræ*, which eventually lose their acid-fast property. In certain cases Dr. Wise found that there had been a marked and persistent increase in the bacillary changes which occur in every leprous patient in greater or less degree; in the majority of the cases treated by nastin a temporary increase of such changes was observed. In a number of instances, however, no increase of the usual natural bacillary changes was noted. Professor Deycke claims that the injections arrest the progress of the disease. But Dr. Wise says that some of the patients undoubtedly got worse under the treatment, while the majority remained *in statu quo ante*: a few improved, and three of them might be regarded approximately as cured. Dr. Wise's conclusion is that since the favourable results are so few longer and wider experience can alone determine whether these successful cases were instances of natural improvement irrespective of the administration of nastin, or whether, on the other hand, the injections played an active part in effecting the disappearance of the leprotic deposits. We must confess that these results are disappointing, for we had been led to hope that the testing of the nastin treatment in British Guiana would yield definite and conclusive evidence of the correctness of Professor Deycke's contentions on behalf of his remedy for leprosy. It is possible that if there had been selections of 'early' cases for treatment by nastin the tabular results might have appeared more favourable."

Ankylostomiasis.

On the sugar estates steady progress was continued in the measures which have now for some time been advocated by this department, viz.:—

(1) The erection of latrines.

(2) The systematic examination of all newly arrived immigrants and of all persons suffering from anæmia or showing the least sign of being infected with the ankylostome parasite.

(3) The treatment and constant observation of all known infected cases.

In this connection it is pleasing to report that every estate is now supplied with latrines. There has been a very marked diminution of the number of cases, particularly of those severe cases which were so common a few years ago. It has also been found practical and advisable to treat the milder infected cases as out-patients.

The introduction every year of a large number of ankylostome-infected East Indian immigrants is a very serious factor in preventing not only much better results, but also the eradication of the disease. Last season between 70 and 80 per cent. of the new immigrants were found to be infected.

QUARANTINE.

During the year there was: (*a*) Yellow fever in Trinidad, Venezuela and Grenada; (*b*) plague in Trinidad and Venezuela; (*c*) small-pox in Grenada.

The precautions permitted by the Quarantine regulations were enforced, and I am pleased to say there was no case of infection. The disinfecting machines were regularly tested and found to be in good working order.

SUBSIDIZED NURSE-MIDWIVES IN DISTRICTS.

During the year twelve women qualified as nurse-midwives. Five students received subsidies, amounting to $137.83, to assist in maintaining themselves whilst undergoing training at the Public Hospital, Georgetown. The examination for these certificates is very much more difficult than formerly. In addition to certificates, sign plates are now given to those women who are certified by Government examination. Midwives' outfits are supplied without charge to certain nurse-midwives to enable them to be in a position to properly perform their duties. I look forward to the day when every village will have at least one qualified nurse-midwife.

The scheme started in July, 1908, for providing an out-door Maternity Department has worked very

satisfactorily and is being largely taken advantage of by poor women who do not for one reason or another care to go to the Public Hospital. For the year 1909-1910, 70 cases were attended in their own homes and 1,172 visits paid. For 1910-1911, 134 cases were attended and 2,872 visits paid.

The work of the out-door midwives is supervised by one of the divisional nurses, but the work has so grown, and is still growing, that the time is approaching when it will be necessary to have a skilled nurse in charge of this most important department. There are five subsidized nurse-midwives in the following outlying districts: Mahaicony, Pomeroon, Moruca, North Western, and Enmore.

Bacteriological Department.

The assistance rendered by the bacteriologists not only to the staff of the public hospitals, but to private medical practitioners, in assisting in the diagnosis of difficult and doubtful cases is well known, and, I am sure, fully appreciated. It is interesting to note that out of a total of 4,481 specimens examined during the year, no less than 1,110 were sent by private medical practitioners.

The total number of specimens examined was 4,481.

During the year specimens of halteridia, proteosoma, gregarines, *Heterakis braziliensis*, *Filaria demarquayi* were sent to the London and Liverpool Schools of Tropical Medicine. A tapeworm of an unknown species was sent for classification. A collection of snakes, lizards, iguanas, &c., was also forwarded. Pathological specimens are forwarded from time to time by Dr. Newham, Dr. Leiper, Dr. Payne and Dr. Boycott.

Since October, 1910, 70 patients have been treated by injection of benzoyl chloride, which acts as a solvent on the fatty capsule of the bacillus and thus leaves it open to phagocytic destruction. The strength of injections used has been 2½ per cent. and 5 per cent. of benzoyl chloride, 1 c.c. of which was injected into the muscles of the forearm.

Ulcers have been dressed with the solution, which has promoted healing, and a nasal spray has been used for many cases which showed many bacilli in the nasal mucous membrane, with a disappearance of bacilli *pro tem.* They, however, recur when the spray is discontinued. The cases treated were not in any way selected, several cases of the anæsthetic type, in which the bacilli are seldom found, being included.

In a few cases where no improvement or destruction of bacilli was noted the injection was after a few weeks increased to 2 c.c. benzoyl chloride weekly, and one case then showed marked increase in bacillary destruction. In many cases where a smear preparation from the nose showed advanced or medium destruction, a scraping from a nodule on the ear, face or limb showed no destruction. In several cases fresh nodules appeared, chiefly on the face and ears, during the treatment. In eleven cases which showed eye symptoms, iritis, corneal ulcer or phlyctenules, treatment was temporarily suspended until the condition improved.

Experiments are still being carried on; the results so far may be summed up as follows:—

17·1	per cent.	showed	slight or no destruction.
32·8	,,	,,	medium destruction.
14·2	,,	,,	advanced destruction.
12·0	,,	,,	very few bacilli.
37·1	,,	,,	no bacilli.
4·2	,,	,,	died.

The above cases were treated under strict observation and frequent estimation of the destruction of bacilli made by the bacteriologist. Many cases treated by the medical superintendent were not placed under bacteriological observation, although their clinical condition was closely observed. The total number of lepers treated was over 200 cases.

Owing to favourable reports on red mangrove bark treatment of leprosy being recorded in the Leper Asylum at Trinidad, a supply of the bark was obtained and six cases of leprosy treated. The powder was made into an ointment with an inert base and applied daily to three of the cases. An infusion was prepared and used in the remaining three cases as a lotion. Both applications have a distinctly cleaning action, but no effect on the nodules, either clinically or bacteriologically, as far as could be detected in a trial extending over six weeks. Its action appears to be that of a mild antiseptic and astringent. Administered internally it appears to have the effect of a mild astringent.

Chlorine-water treatment of ankylostomiasis. The lines of investigation we adopted were as follows:—

Enumeration of Ova before and after Treatment.—The technique was as follows: The total amount of fæces passed each twenty-four hours was collected, thoroughly mixed and weighed. A known weight was then taken, the ova present enumerated, and from the relative proportions the total number of ova passed in twenty-four hours calculated. This was done before and after each treatment with chlorine water and thymol for the purpose of comparison. In some cases the enormous total of 585,600 ova was passed in twenty-four hours.

Enumeration of Adult Nematodes before and after Treatment.—This was carried out in the usual manner by means of a strainer and was done by the medical officer personally.

Blood Estimation.—The red corpuscles were enumerated and the hæmoglobin index worked out before and after treatment with (*a*) chlorine; (*b*) thymol.

Differential Blood Counts were carried out at the expiration of treatment, a period of a week being allowed to elapse before taking the blood specimen.

Eleven cases were selected for treatment with chlorine water, as suggested by Dr. Barnes. Each case was carefully demonstrated to have a large number of ankylostome ova present before investigation started.

Of these cases three were treated as follows: 1½ oz. liq. chlorine was administered at 4, 5 and

6 a.m., followed by 4 oz. aperient mixture at 7 a.m. This treatment was repeated on three occasions at intervals of a week.

In no case were adult ankylostomes detected in the stools. The numbers of ova present in the total stools passed in twenty-four hours remained constant.

These same cases were then treated with thymol in the following manner: 10 gr. of thymol was administered at 4, 5 and 6 a.m., followed by 4 oz. aperient mixture at 7 a.m. The numbers of ova were carefully noted, also the number of adult ankylostomes passed in each stool during the twenty-four hours following the administration of the thymol and the aperient.

Case 1, numbers of adults in each stool, 290, 30, 20, 15, 12, 4, 0; total for twenty-four hours, 371.

Case 2, numbers of adults in each stool, 11, 20, 20, 11, 9, 23, 16, 0; total for twenty-four hours, 110.

Case 3, numbers of adults in each stool, 0, 14, 2, 2, 0, 0, 0; total for twenty-four hours, 18.

The total numbers of ova present showed a gradual decrease during the same period.

Three cases were treated as follows: A mixture of quinine sulph., 5 gr., dissolved in chlorine water, 1 oz., was administered three times daily for a period of seven days. The result was as follows: Case 1 passed 2 adult ankylostomes; Case 2 passed no adult ankylostomes; Case 3 passed no adult ankylostomes. The numbers of ova present in the stool remained constant during the whole of this period.

Note.—Case 1 refused further treatment and went out before he could be treated with anthelmintics.

Cases 2 and 3 were then treated as follows: Thymol, 10 gr., at 4, 5 and 6 a.m., followed at 7 a.m. by 4 oz. aperient mixture.

The numbers of adult ankylostomes detected in the fæces for the twenty-four hours immediately following treatment were as follows: Case 2, numbers present in stools, 24, 4, 0, 0, 0; total five days, 28. The numbers of ova present in the stool showed a progressive diminution. The patient then went out.

Case 3 was a very serious one inasmuch as no treatment was effective in removing the adult ankylostomes from the intestines; but the numbers of ova present in the stool remained constant and very numerous throughout the investigation. The results of examination of twenty-four hours' stools were as follows: Thymol treatment, 0, 0, 0, 0, 0; Phillip's mixture, 0, 0, 0; beta naphtol, 0, 0, 0. Numbers of ova present remained fairly constant.

The patient died at a later date, and a careful search revealed a large number of ankylostomes present in the small intestines, the total number adherent to the mucous membrane being 156.

Two cases were treated as follows, the same routine examination being carefully carried out: Chlorine water, ½ oz., was administered every two hours for seven days, an aperient was administered if a daily evacuation was not obtained.

Case 1 passed one adult ankylostome only. There were large numbers of ova present during the whole of the treatment, the numbers showing no appreciable diminution. The patient then went out, refusing further treatment.

Case 2 passed two adult ankylostomes, and the fæces showed presence of large numbers of ova. The patient died before treatment with thymol or other anthelmintics, and a search at the *post-mortem* revealed the presence of 105 ankylostomes in the intestines.

Three cases were treated as follows, and under the same conditions as regards examination:—

Chlorine water, 1 oz., was administered every two hours for seven days, the result being as follows: Case 1 passed no adult ankylostomes, ova very numerous; Case 2 passed no adult ankylostomes, a few ova detected; Case 3, no adults passed, but patient passed large quantities of blood and mucus, so treatment stopped. Cases 1 and 2 were then treated with thymol as before, the results being as follows:—

Case 1, adult ankylostomes, 66, 52, 5, 5, 0, 52, 0; total for seven days, 280. Case 2, adult ankylostomes, 59, 1, 0, 0, 0, 0, 0; total for seven days, 60. No ova were detected in either case.

Blood investigations were carried out in twelve cases, the red blood corpuscles being enumerated by the Thoma-Zeiss Hæmocytometer and the hæmoglobin estimated by means of Gower's Hæmoglobinometer.

In many cases large numbers of poikilocytes were observed, indicating the large amount of blood destruction present. The blood-counts generally are very anæmic in character, except in a few instances, although the anæmia is not of the pernicious type. Differential blood-counts were made by Leishman's method a week after treatment had been discontinued.

Pyocyaneus.—This organism, comparatively rare in England, is of frequent occurrence in British Guiana. During the last twelve months upwards of thirty specimens have been isolated from a variety of cases.

The true *B. pyocyaneus* has been isolated from vat waters, and in the analysis of sixty samples of milk its presence was detected in four. Probably in both milk and water the bacillus was of fæcal origin, being in the latter case carried by the carrion crows which abound in the town to the roofs from which the water supply of the town is collected.

E. P. Minet.

Public Hospital, Georgetown.

The nurses and servants are drilled once a month in fire practice by one of the senior sergeants of the Fire Brigade.

The condition of grounds and buildings remain much the same, only ordinary repairs having been undertaken by the Public Works Department.

Water Supply and Dietary.—The Lamaha water is used for bathing and washing, and rain-water, which is stored in large tanks and vats, for drinking, cooking, and medicinal purposes. Our total storage capacity is 207,400 gallons.

The highest number of males in hospital on any

day was 324 on January 10, 1911, and of females the highest number was 243 on October 24, 1910. The highest total number of patients in hospital on one day was 561 on January 9, 1911. The lowest number of males was 254 on May 15, 1910, and females 149 on March 27, 1911. The lowest total number, 411, on May 5, 1910.

The death-rate of those who come to hospital too late for all human aid still keeps high, and shows a tendency to increase. In all 290 died within twenty-four hours of admission, which is 21·5 per cent. of our total deaths.

That practically 40 per cent. of our deaths should occur during the first seventy-two hours is indeed discouraging; a large number of these would have had a far better chance had they come earlier and had the advantage of good nursing.

Our pneumonia death-rate is considerably higher than in Europe, the chief reason being undoubtedly due to the delay in coming to hospital.

It is quite a common occurrence for the ambulance to bring in some poor patient in a moribund state, having been picked up on the side of the street, suffering from advanced pneumonia of six days' standing. The sick people do not realize the importance of early hospital treatment, although we are continually pointing out the dangers they run by waiting until the last moment.

There were admitted during the year ending March 31, 1911, 6,450 males and 4,609 females; total, 11,059. Of these, 130 were unallotted immigrants, 20 were indentured immigrants from sugar estates, 855 were free immigrants from sugar estates, and 1,639 were immigrants from other places than sugar estates; 65 were Chinese.

There died in hospital 826 males, 522 females; total, 1,348. This gives a percentage of 12·7 males and 11·4 females and 12·2 per cent. on the total number of cases treated to a termination, and is 1·2 per cent. higher than last year.

The average daily number was males 286, females 189; total, 475. The deaths of children under 1 year were males 86, females 75; total, 161. The deaths of children from 1 to 5 years were males 45, females 49; total, 94. This makes a total of 235 deaths in children under 5 years of age, or 18·9 per cent. of our total death-rate.

This number is enormous, and I cannot too strongly emphasize the fact that this to a large extent is due to malnutrition consequent upon improper feeding, producing an enteritis with an accompanying broncho-pneumonia which rapidly carries the child away.

There were 492 deliveries in the Maternity Ward with 18 deaths, 7 of which were due to eclampsia and 1 to septicæmia. There were 73 stillbirths and 39 abortions.

There remained in hospital on March 31, 1911, 276 males and 220 females; total, 496. The out-door patients for the year were 16,617 males and 25,291 females, a total of 41,908, which is 1,648 less than for the previous year, 1909-10.

There were admitted into the Phthisical Ward 122 males and 51 females; total, 173. There died in this ward during the same period 32 males and 15 females; total, 47. And there were discharged 61 males and 48 females; total, 109.

The death-rate from pneumonia for the year was 44·5 per cent.

Practically all these cases were admitted in an advanced stage, and as pneumonia is a disease which lasts as a rule about eight days, if only those suffering from it would come in earlier I am certain in a very short period we should have our death-rate down as low as that obtained in European hospitals.

Typhoid fever shows a large increase for the year; in all we had 60 cases with 19 deaths, or a death-rate of 31·6 per cent. There were twice as many cases as the year before, and ten times more than five years ago. The disease is certainly increasing annually and already the numbers are becoming alarming.

A. J. Craigen.

Public Hospital, New Amsterdam.

The Public Works Department did the following repairs: Relaid concrete in No. 1 Laundry and made new troughs, repaired floors in the wards, relaid boiler wall and repaired range. The roads and grounds are in good order.

The pail system is employed, and the excreta removed daily by the Town Council. A bathroom and a lavatory is attached to each ward. The drainage of the grounds is by open drain.

The water supply is of two kinds, viz.: rain-water for cooking and drinking purposes stored in tanks, and creek water for bathing and laundry work.

There are 150 beds in the hospital. The highest number resident was on July 24, 1910, when there were 101 males and 57 females; total, 158. The lowest number resident was on April 25, 1910, when there were 82 males and 33 females; total, 115.

A. A. McKinnon.

Public Hospital, Suddie.

Sanitary Arrangements and Drainage.—The contents of the soil buckets are dumped into trenches in the portion of ground to the south of the hospital. The drainage is fairly good.

The Water Supply consists of rain-water collected from the roofage of the hospital and is stored in three large iron tanks, two of which have a capacity of 36,000 gallons, and the third a capacity of 25,000 gallons.

The greatest number of patients in hospital on any one day was 95, on March 9, 1911. The least number of patients in hospital on any one day was 50, on March 4, 1910.

Of the 197 deaths for the year 135 died within 72 hours of admission. The daily average number in hospital was 68·199. There were 4,567 out-patients treated. There were 17 births, of which 4 were stillborn.

J. Sholto Douglas.

Colonial Medical Reports.—No. 32.—British Guiana— *(continued).*

PUBLIC HOSPITAL, BARTICA.

The conduct of the staff was satisfactory. Buildings in fair order. Sanitary arrangements and drainage good. Water supply and dietary ample and good.

Accommodation: Male Ward, 24 beds; Female Ward, 11 beds; total, 35.

The greatest number in hospital on any one day was 16 (November 2, 1910), and the least number was 1 (December 29, 1910).

Of those who died: 4 died within twelve hours of admission, 7 within twenty-four hours, 2 within forty-eight hours, 3 within seventy-two hours. The death-rate on the total treated was 11·3.

J. TEIXEIRA.

PUBLIC HOSPITAL, MORAWHANNA, N.W.D.

The hospital at Morawhanna has accommodation for 14 male and 11 female patients.

The Arakaka Ward has accommodation for 12 patients.

During the year under review the number of admissions was as follows, viz.: Males, 338; females, 149. There remained in hospital from the previous year: Males, 11; females, 6.

The number of deaths in the institution during the year 1910-1911 was: Males, 26; females, 6. The principal diseases treated this period were: Malarial fever, diarrhœa, dysentery, anchylostomiasis, pneumonia, and phthisis.

The death-rate on total number treated was: Males, 7·4 per cent.; females, 3·8 per cent.

Some of the cases treated came into hospital in a moribund condition. Of those that died within twelve hours after admission there were 3 males. Of those died within twenty-four hours, 2 males. Of those died within forty-eight hours, 4 males and 1 female. Of those died within seventy-two hours, 1 male and 1 female.

Public Hospital, Morawhanna.—The building is commodious and well ventilated, the one serious drawback being the troolie roofing. At present there is considerable leakage in the operating theatre owing to the separation of the joint between the theatre and the main building due to the sinking of the former. Troolie, as a rule, presents serious objections, since it constitutes the habitat of the rat, bat, wood-ants, beetles, fleas, cockroaches and similar pests. The chief objection to it lies in the fact that the water collected for drinking purposes for patients in the hospital is liable to frequent and easy contamination, by reason of the dead decomposing bodies of the pests enumerated above passing in minute particles into the water so collected in the vat. Recently samples of water from vats within the compound were examined by the Government Bacteriologist and the report so far as producing disease was concerned was favourable; yet the troolie roofing is a constant menace to health statistics of the hospital, and this menace should be removed.

Hospital Compound, Morawhanna.—The compound has been kept constantly cleaned during the year. The place continues to be light and cool.

The Village of Morawhanna.—The local sanitary authority has recently rebuilt the principal thoroughfare and now it is in fair condition. The drainage of the village is in a very deplorable state. The main draining trench and various other small trenches that empty into it required digging and cleaning. With regard to the sewage disposal, the pail system should be substituted for the present system, which consists of closets over trenches that are tide flushed.

Arakaka Ward.—The building has accommodation for twelve patients. It is very well ventilated and has been tidily kept during the year under review. Some minor repairs have been done to it and it is now in very fair condition. The roofing is of troolie, which presents a similar menace to the roofing at Morawhanna and should be removed.

Regular district visits have been made during the year. The sanitation is good. Frequent visits have been made along the Barima-Barama road and the people found to be fairly healthy.

Barama River.—Regular quarterly visits were paid to this district. It is not as healthy here as in other portions of the north-western district. Malaria, anchylostomiasis and gastro-intestinal disturbance were among the chief ailments. Free medicines have been regularly supplied to the Mission at St. Bede's, where many of the aboriginals congregated. Quinine has been freely distributed and it is found to be of decided benefit to the inhabitants of this district, the number of fever cases from this part steadily decreasing.

GEO. E. CARTO.

PUBLIC LUNATIC ASYLUM, BERBICE.

The grounds have been kept in fair order, free from weeds, and flower-beds laid out; the drains have been kept in good order; during the year the main drainage trench was dug by prison labour.

The sanitary arrangements and drainage continued to be the same as in previous years; the necessity of concreting the drains carrying off slop-water from bathrooms and sculleries continues, but lack of funds prevents this being done. The excreta are buried in pits dug for the purpose.

The rain-water in the tanks and vats attached to the buildings and the creek water from the waterworks have proved sufficient for the actual needs of the institution; during the year all but two of the vats and tanks were cleaned internally, and the date of the cleaning marked on the outside; they all remained mosquito proof and free from gross impurities. The quality of the creek water is the same and its dirty brown colour is specially noticeable on the days that the fire brigade calls for pressure.

The dietary of the attendants and patients has been ample and of good quality; the enamel food buckets with covers have done good service and have worn well; their advantages in rainy weather have been well demonstrated.

The chief diseases treated were: Intermittent and remittent malarial fevers, diarrhœa, dysentery, lung affections and cutaneous eruptions, besides the usual forms of insanity. There were no cases of epidemic disease during the year. The usual preventative dose of quinine was administered weekly to every attendant and patient during the last quarter of the calendar year, with satisfactory results.

Employment: In addition to the usual forms of employment suitable for the patients, the making of coconut oil for the use of the female patients has been started; this not only provides employment for a certain number of females in picking the husks, but also saves the value of sweet oil for toilet purposes.

There were only two escapes, one male patient being brought from Smithfield about six hours after having been missed, and the other a male East Indian, found a short time afterwards; there were nine attempts at escape, but in these the patients did not go beyond the asylum boundaries.

Q. B. DE FREITAS.

PUBLIC LEPER ASYLUM, MAHAICA.

Sanitary Arrangements and Drainage.—The pail system is in use, the excreta being buried and soiled dressings burnt. The drainage of the asylum is perfect. Two concrete drains were built at a very small cost.

The water supply is sufficient, though there are a few vats in very bad condition.

The behaviour of the inmates was good; absconding continues, but to a very limited extent.

Average daily school attendance: Male, 17; female, 8.

Amusements.—Concerts, dramatic performances, dancing, cricket and football matches and other athletic sports and amusements, including magic-lantern demonstrations, were indulged in by the inmates. The harmonium, gramophone and music-box are in good condition.

The farm is in excellent condition—everything grown is turned to account.

The coconuts are now gathered and used for making oil; the husks are used as fuel in the kitchen.

The death-rate on the total number of inmates treated was approximately: Males, 15; females, 19·3.

There were four cases—two males and two females—discharged by order of His Excellency the Governor, cured, the result of nastin treatment.

The diseases principally treated other than leprosy were malarial fever, diarrhœa, dysentery, bronchitis, Bright's disease, and tuberculosis.

The nastin treatment was continued through the year—judging from the bacteriological reports, the clinical and physical appearances, a large number of the inmates have benefited greatly by the treatment. They are most anxious to submit themselves to treatment.

J. S. NEDD.

Colonial Medical Reports.—No. 33.—Grenada.

MEDICAL REPORT FOR THE YEAR 1911.

By EDWARD DRAYTON.

Colonial Secretary.

METEOROLOGICAL RETURN FOR THE YEAR 1911.*

Month	Temperature						Rainfall		Winds	
	Solar minimum	Solar maximum	Shade minimum	Shade maximum	Range	Mean tension of vapour	Amount in inches	Degree of humidity	General direction	Average force
					a.m.	a.m.		a.m.		
January ...	126·0	140·0	69 0	84·0	5·8	·656	5·00	72 0	N.E.	159·0
February	105·0	141·0	69 0	87·0	5·0	·699	2·77	74·0	N.E.	92·4
March	138·0	142·0	68·0	90·0	7·7	·635	0·96	64·0	N.E.	125·8
April	123·0	141·2	71·0	87·0	6·0	·713	1·67	70·0	N.E.	139·3
May	131·0	142·0	72·0	90·0	5·9	·745	3·41	72·0	E.	137·1
June	96·0	140·0	71·0	85·0	3·6	·801	19·36	82·0	E.	101·4
July	110·0	141·0	72·0	86·0	4·7	·787	5·52	77·0	E.	142·0
August	117·0	141·0	74·0	90 0	4·4	·812	7·93	75·0	E.	135·6
September	129·0	141·0	72·0	90·0	4·7	·823	7·86	77·0	E.	97·7
October ...	121·0	141·0	73·0	90·0	5·5	·812	3·15	74·0	S.E.	60·8
November	113·0	140·0	72·0	87·0	4·7	·795	5·86	77·0	E.	137·5
December	124·0	141·0	71·0	86·0	4·0	·746	5·64	77·0	E.	180·4
Averages...	119·4	140·9	71 2	87·7	5·2	·752	5·76	74·2	E.	124·1

* At Richmond Hill Meteorological Station in the South of the Island.

RETURN OF STATISTICS OF POPULATION FOR THE YEAR 1911.

Population of Colony at census on April 2, 1911		66,750
Estimated births from April 3 to December 31, 1911	2,024	
Estimated deaths from April 3 to December 31, 1911...	905	
Increase of		1,119
		67,869
Excess of emigration over immigration		21
Estimated number of inhabitants at December 31, 1911		67,848

COLONY HOSPITAL.

The total number of patients admitted to the hospital during the year was 902, a decrease of fifty on the numbers of the previous year.

The following table shows a comparison with the two previous years:—

	1911	1910	1909
Number of patients treated	971	1,031	843
,, ,, discharged cured	674	627	462
,, ,, ,, relieved	169	298	250
,, ,, who died ...	36	37	52
,, ,, remaining December 31	92	69	79
Average stay of all patients in hospital	30·7	30·2	36·2

Of the thirty-six deaths, twenty were males and sixteen females; the percentage mortality being 3·7 per cent.

There were fifty-four paying patients and forty-five constables under treatment in the hospital during the year.

The number of patients suffering from venereal disease and ulcers treated in the hospital was 244. The average stay of these patients was 47·61 days.

Regarding the prevalence of ankylostomiasis in the island, the number shown under that head in the list of diseases gives an erroneous impression of its occurrence. The numbers shown in the list of diseases enumerate only those cases of ankylostomiasis which were uncomplicated. As shown in the report, 60 per cent. of the sick population treated were suffering from this disease; and further work has assured me that that figure is not an exaggerated one.

The following table shows the attendances in the Out-patient Department during the year:—

Number of Prescriptions issued.	
Free	1,032
Payment	720
Number of Attendances.	
Paupers	40
Labourers' children	324
Aged	68
Police constables	164
Labourers	723

As bacteriologist I was called upon to inquire into the nature of the outbreak of anthrax at Dougaldston Estate, Gouyave; and I wish here to thank Dr. O'Neale, Mr. Saunders, and Sergeant Briggs for the assistance given me in the sending of samples and preparation of blood films.

R. P. COCKIN,
Resident Surgeon.

YAWS HOSPITAL.

The total number of patients treated during the year was 339, of which number 268 were admitted during the year.

The number of discharges during the year was 276; of these 178 were males and ninety-eight females.

Two deaths occurred during the year, one a male, the other a female. The cause of death in each case is certified as due to an inter-current malady and not to yaws.

During the year a limited number of cases have been treated with salvarsan, and the results obtained have been such as to justify further work being carried out with this drug. Some cases are at present under treatment in the institution and are making good progress.

The remarks made in the report on the Colony Hospital regarding ankylostomiasis are even more applicable in the case of yaws than of other patients, and it is exceptional to examine specimens from yaws patients with a negative result.

R. P. COCKIN,
Resident Surgeon.

ST. ANDREW'S DISTRICT HOSPITAL.

The admissions for the last five years are detailed beneath:—

	1907	1908	1909	1910	1911
Admissions ...	145	166	150	165	166

No changes occurred in the staff during the year. No one had either vacation or sick leave. One Hamilton Joseph was accepted as a student in the dispensary, with His Excellency's approval, in May.

The birthplaces of those treated in the hospital were: Barbados, 7; St. Vincent, 8; Trinidad, 3; India, 4; Africa, 1; Carriacou, 3; Grenada, 140.

The hospital buildings are in good order. The Public Works Department has promptly remedied minor defects whenever reported. The grounds about the hospital have always been neat and well kept.

The free prescriptions have increased from 2,606 in 1901 to 6,499 in 1911.

The quantity of quinine used in the district dispensary is given beneath as it affords some indication of malarial fever treated in the district:—

1907	1908	1909	1910	1911
13 lb. 4 oz. ...	12 lb. 8 oz. ...	15 lb. ...	12 lb. 8 oz. ...	11 lb. 2 oz.

The reduction in the amount used is due to a subsidized dispensary in Dr. Whiteman's district, established in 1910.

N. S. DURRANT.

BELLE VUE HOSPITAL, CARRIACOU, GRENADA.

Seventeen patients remained in from the previous year and 196 were admitted—making a total of 213 treated for the year.

The average number of patients per day was 20·5.

Two deaths occurred in hospital—one from intussusception of the bowel, the other from lobar pneumonia.

The buildings are in fine order, beautifully

RETURN OF DISEASES AND DEATHS IN 1911 IN THE COLONY, YAWS, ST. ANDREW'S AND CARRIACOU HOSPITALS.

Grenada.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	2	—	2
Anæmia	13	—	17
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	1	—	1
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	4	—	4
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	1
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	20	2	20
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	11	—	11
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	1	—	1
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	96	2	100
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	21	1	23
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	14	—	14
Malignant	3	1	3
Old Age	—	—	—
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	1	—	1
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	34	—	27
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	2	—	2
(*b*) Secondary	60	1	61
(*c*) Tertiary	41	1	47
(*d*) Congenital	5	—	5
Tetanus	1	—	1
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	268	2	339
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	37	1	42
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	34	2	34
(*b*) Other Diseases	34	4	36
Digestive System—	—	—	—
(*a*) Diarrhœa	2	—	2
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	4	—	4
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	1	—	1
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	1	—	1
(*g*) Cirrhosis of Liver	5	1	5
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	83	9	90
Ear	4	—	4
Eye	43	—	46
Generative System—	—	—	—
Male Organs	35	1	40
Female Organs	54	2	56
Lymphatic System	17	1	20
Mental Diseases	5	—	5
Nervous System	20	2	20
Nose	7	—	7
Organs of Locomotion	20	1	25
Respiratory System	52	1	55
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	3	—	3
(*f*) Other Diseases	167	2	195
Urinary System	64	4	66
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	1	—	1
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	82	2	91
Parasites—	3	—	4
Ascaris lumbricoides	2	—	2
Oxyuris vermicularis	1	—	1
Dochmius duodenalis, or Ankylostoma duodenale	103	3	104
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	1	—	1
Poisons—	1	—	1
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	1	—	1
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	1	—	1
,, Minor	1	—	1
Other Operations	66	2	66
Eye	—	—	—
(*a*) Cataract	2	—	2
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	1	—	1

situated on the top of a hill, they are spacious, clean, and well kept.

Twenty-two cases of malaria were treated in hospital. They were admitted chiefly along the coast-line and especially the district round about L'Esterre, where the area is covered by swamps.

One case of tetanus was successfully treated by hypodermic injections of curare. It is perhaps early to dogmatize on the benefits of this drug in the treatment of tetanus—the fact remains that the case referred to was one of more than ordinary severity and the result was very gratifying.

Ulcers are very common in this district and seem to prevail in the last quarter of the year. A small amount of cleanliness would prevent the formation of many an ulcer.

EDWIN WELLS, M.B.,
Medical Officer, Carriacou District.

LUNATIC ASYLUM, RICHMOND HILL.

The total number under treatment during the year was 159, seventy-six males and eighty-three females; last year the number was 170. This decrease in numbers is due to admissions from St. Lucia having been stopped, on account of the overcrowded state of the asylum.

The year opened with 134 inmates, sixty-five males and sixty-nine females.

During the year there were twenty-five admissions, eleven males and fourteen females, including one male and three females from St. Vincent.

Of the twenty-five admissions, fifteen were admitted for the first time to an asylum, and ten had been in this or some other asylum at least once before.

There were twenty-three discharges, twelve males and eleven females. Three of the males belonged to St. Lucia and three females to St. Vincent, nine males and eight females belonged to Grenada.

The average stay of the twelve males discharged was 244 days, while that of the eleven females was nearly five years; the longer average stay of the latter was due to the three St. Vincent females who had been in for many years and were discharged to be sent to the Poor House.

There were nine deaths, six males and three females.

The percentage of deaths based on the daily average was 6·91.

The percentage of discharges based on the number of admissions was 94.

The number remaining in at the end of 1911 was 127; males fifty-eight, females sixty-nine.

There were three cases of enteric during the year, one among the male inmates and two among the female. All terminated favourably.

There were a few cases of injury to patients caused by patients, but nothing of a serious nature.

Seclusion under lock and key was resorted to on eighty-two occasions, chiefly because the offender would not keep on his or her clothes. The restraint belt was used seven times.

A considerable number of the male inmates were employed in agricultural work on land belonging to the asylum, while others were employed as carpenters, masons, painters, cooks, and scavengers. The women are chiefly employed in sewing and washing clothes for this institution and for the Poor Asylum.

Very little can be done in the way of amusing the inmates, but the men play ball and marbles; music is provided and dancing arranged for once or twice a year.

One or more religious services are held every week.

A system of water closets is at present being installed, and should prove a great benefit to the institution. These closets will discharge into septic tanks outside the asylum walls.

The attendants and servants performed their duties satisfactorily throughout the year. The staff of female attendants was increased by one, to permit of one half of the staff being off duty every evening.

E. F. HATTON,
Medical Superintendent.

REPORT OF DISTRICT MEDICAL OFFICERS.

DISTRICT NO. 1.—ST. GEORGE'S.

The probable population of the district for the year under review would be about 6,637, and is obtained by adding certain figures calculated from the census returns to the excess of births over deaths from April 2 to December 31, viz.:—

Population of town (4,916) less 180 to No. 3 District	4,736
Population of parish sections 1, 2, 3, and 5 (2,353) less 300 to Woburn and 200 under section 5 ...	1,853
Excess of births over deaths from April to Dec. 31...	48
Total	6,637

Population	6,637
Births during the year	182
Deaths during the year...	97
Birth-rate per 1,000	27·42
Death-rate per 1,000	14·61

The population return for the previous year was given as 7,511, but I am inclined to regard that as excessive and to place more reliance on the present figures. No account is taken in this calculation of the effects of emigration or immigration.

There was a good deal of sickness during the latter five months of the year due to a prevalence of malarial fever and dysentery and the occurrence of an epidemic of influenza; this epidemic was widespread, persons of all ages being attacked; the character of the disease was severe in some cases, three being complicated with pneumonia, one with pleurisy and many with severe bronchitis.

Of 624 cases of malarial fever seen during the year 105 were met with during the month of October. The total number of deaths recorded was 97, representing a death-rate of 14·61 per 1,000 of the population; of this number 22 were of children 1 year old and under; the mortality was fairly evenly distributed over the whole year.

The prevalence of rains during the latter part of

the year would be instrumental in determining the increased amount of sickness recorded for that period.

Particular Diseases that have occurred during the Year.

Pulmonary Tuberculosis.—This disease still maintains its prevalence; there were more new cases seen this year than during the last; the same factors exist for facilitating its occurrence, viz., faulty domestic hygiene and absence of institutional treatment for arresting the disease during its early phases and for the segregation of advanced cases with the object, amongst others, of removing sources of infection. The contemplated special hospital for pulmonary tuberculosis is urgently needed, and by the provision of which much relief is anticipated.

Yaws.—Of eleven cases of this disease that were recommended for admission to hospital, seven only originated in this district, which can still claim a comparative freedom from this loathsome disorder.

Dysentery.—There were 113 cases with 5 deaths, as compared with 42 cases and 2 deaths for the previous year; it will be apparent by the mortality that the disease was not of a severe type.

Malarial Fever.—The number of cases of this disease seen was 624, and the number of deaths attributed to it was 4, all being among children from $2\frac{3}{12}$ years and under; the fatal result in three cases being directly attributable to convulsions, the result of high temperatures. The absence of any deaths among adults testifies to the mild type of fever.

There was one case of black-water fever, seen in a child aged 5 years, occurring at Grand Mall, outside this district; the case gave a history of frequently recurring attacks of malarial fever which had only received home treatment.

Leprosy.—One fresh case was seen and recommended for admission to the Pauper Asylum, which is the only institution at present available for the sporadic cases that occur. A death took place from acute laryngitis and bronchitis in a case of the disease previously reported.

Syphilis.—Sixty-two new cases of this disease were seen and were made up as follows: Congenital 22, primary 11, secondary 14, and tertiary 15.

Under the last heading a great number of old acquaintances keep on reappearing, the inclusion of which would tend to augment these numbers very considerably. There were four deaths all among the congenital class.

During the year I employed the treatment by salvarsan (" 606 ") in two cases and in conjunction with Dr. Mitchell in a third; the method adopted was the intramuscular injection and the advisability of following this up with some form of mercurial treatment was emphasized; the results were satisfactory; the expense of this form of treatment is, of course, prohibitive to the many.

The well-recognized difficulty of getting patients to submit to treatment for a sufficiently long period is constantly being experienced, and this even among those of an intelligent class.

Typhoid Fever (Enteric).—Two cases were seen for the year; of these only one originated in the district, the other being brought in from St. John's; it arrived in the town on December 10 and terminated fatally from intestinal hæmorrhage on December 14. An isolation ward at the Colony Hospital is a necessity for such cases, especially when the disease occurs among the poorer class of patient.

Ankylostomiasis.—During the year, of twenty-seven cases seen and recommended for hospital treatment, only five originated in this district; two in town, two at Grand Anse, and one at Woodlands the remaining twenty-two came from differen localities over the island. This district can be con sidered to suffer very little from this disease; at any rate, it is rare to come across a case that exhibits the characteristic anæmic appearance which stamps those that harbour, to a marked extent, the parasite (*Ankylostomum duodenale*) of the disorder, for it is a recognized fact that " there may be dozens of ankylostomers in the intestine without any appreciable anæmia, or, indeed, symptoms of any description whatever. One must be careful, therefore, to avoid concluding that the ankylostomum is the cause of every pathological condition with which it may chance to concur."

Filariasis.—One case of filarial disease was seen and recommended to hospital; the right leg and thigh were affected, and the disease was present as lymphangitis, abscess, and some elephantiasis of the limb in question. The history of the case was as follows: He lived in Trinidad for seven months in 1907, when he suffered from his first attack; he had a second in Grenada a year previous to this, his third attack. All the cases of filariasis I have seen here have contracted the disease outside of this colony; I have never seen a case in which the infection can be ascertained to have originated here; I naturally conclude that in this case the infection took place in Trinidad.

The general sanitary condition of the district was on the whole good. The epidemic of influenza already referred to, in spite of being widespread, was not responsible for any deaths; nor were the cases of malarial fever seen, though greater in number than that of the previous year, severe in type, as is evidenced by a mortality of only four and that among children.

I am unable to record any practical advance in anti-malarial works for the year under review; a committee, however, appointed for making recommendations on this subject, has recently sent in an exhaustive report.

The water supply in the town is plentiful and good, and the extension of a service to Belmont a great blessing to residents in that direction.

The very desirable removal of siltings in the Carenage, it is anticipated, will form part of a scheme for harbour improvements under contemplation by a committee recently appointed for that purpose. There still exists considerable discomfort and annoyance from the pollution of the air consequent on the method adopted in the disposal of night soil; the introduction of an efficient water

sewerage system to remedy this evil is by no means one of the least necessary improvements to be envied.

The number of successful vaccinations of infants was 151; this was less than that of the previous year owing to the prevalence of influenza among children during a certain period.

The vaccination and re-vaccination of adults imposed as a result of travelling regulations assist with the vaccinating of infants in maintaining a high standard of efficient vaccination of the community and thereby a protection from small-pox.

Quarantine restrictions were imposed against Brazil for plague and small-pox; against Venezuela for plague, small-pox and yellow fever; against Trinidad for plague; and against Panama for yellow fever. The usual precautions of fumigation of ships and surveillance of passengers were adopted, and it is pleasing to record that none of these diseases gained an entrance into the colony. The Quarantine Station was not occupied for the year.

The following duties, imposed by the Quarantine and Rats Ordinances, were performed for the year: Visits of inspection paid to ships, 57; number of vessels fumigated, 41; number of passengers examined daily during periods of surveillance, 365; the number of Bills of Health issued was 176.

G. W. PATERSON,
Medical Officer, No. 1 District.

DISTRICT No. 2.—RICHMOND HILL.

The estimated population is about 4,500, and includes one of the most desirable residential districts in the Colony. The greater part of it is situated on high ground, is well supplied with water, and is practically free from malaria, but there are certain localities, such as Woburn and Caliviny, which are malarial and are badly supplied with water.

The health of the district was above the average as compared to previous years, no disease was epidemic or even more than usually prevalent. The only disease notified under the Infectious Diseases Ordinance was enteric, of which there were five cases, three of them occurring in the lunatic asylum. Five cases of yaws were sent to the Yaws Hospital.

There were 118 vaccinations performed during the year.

No special sanitary work was undertaken during the year, but the sanitary inspector was active and did some good work.

There is great need of an organized campaign in sanitary matters, especially in regard to the disposal of excreta. Latrines are conspicuous by their absence among labouring classes and small proprietors. The usual method of disposing of excreta is to throw it on the land, without any pretence at covering it with earth. It is not therefore difficult to account for the prevalence of dysentery, diarrhœa, and ankylostomiasis.

The districts of Woburn and Caliviny are very badly off for water, being dependent on ponds and rain water stored in tanks; this has to be carried long distances, and is deficient both in quantity and quality. A fair supply could be given to these places by laying a pipe from the reservoirs of the St. Paul's Water Works at Richmond Hill, along the ridge through Morne Jaloux to the Main Lower Road at its junction with the Woburn Byeway, where it might connect with the pipe of the River Soulier Water Works continued from Belmont.

Overcrowding in the houses of the labourer and peasant proprietor, especially at night, is responsible for a great deal of sickness, but it is an evil which can only be overcome by an increased earning capacity of the people, and a general improvement in the standard of living.

E. F. HATTON,
Medical Officer.

DISTRICT No. 3.—ST. GEORGE'S.

The general health of the district was fairly good during the year. Malarial fever, however, showed little diminution on the previous year, there being 443 cases treated as compared with 445 in 1910. No epidemics occurred during the year.

The mortality was fairly constant throughout, and apparently did not show the usual increase during the last quarter. The infant mortality was much below that of the previous year, the latter being exceptionally high owing to the epidemic of whooping-cough.

One further case of beriberi in its convalescent stage was seen in the early part of the year, the disease being contracted at Brazil.

I am of opinion that ankylostomiasis is on the increase in this district. Formerly it was practically confined to Mt. Moritz, Constantine and Boca, but it seems now to be spreading to all parts of the district. The time has arrived when active measures should be adopted for controlling this disease.

The sanitary condition of the district is good. No new anti-malarial measures were carried out during the year. The drains which were opened in the Willis District last year have been kept open and have effected much improvement.

Two hundred and twelve vaccinations were performed during the year as compared with 196 the previous year.

T. C. ORFORD,
Medical Officer, No. 3 District.

DISTRICT No. 4.—GOUYAVE.

The general health during the year was satisfactory, and no formidable disease was recorded. During the early months of the year there was a good deal of sickness amongst children and infants, due to an epidemic of pertussis, and in the latter part of the year the general health of both adults and children was disturbed by an epidemic of influenza.

Malarial fever, dysentery, bronchitis, and gastro-enteric disorders of children formed the majority of attendances given during the year.

Malarial Fever.—There were 532 cases of this disease recorded, showing an increase of fifty-seven

cases over the preceding year and this increase was probably caused by the excessive rainfall which occurred on two or three occasions during the year; the type of the fever was, however, not malignant, as is testified by the low death-rate, eleven deaths only being recorded from this malady.

Dysentery.—One hundred and eighty-four cases of this disease were attended, of which 139 were children and infants and forty-five were adults. In general the disease was of a mild type, but many cases showed the tendency to recurrence after convalescence had well set in, and in a few cases the disease took on a more or less chronic type.

Bronchitis.—One hundred and seventy cases of this disease were noted, a good many occurring in the months of July and August; the majority, however, obtained during the last few months of the year and being infectious in type were probably influenzal in origin.

Pertussis, which commenced towards the close of the year 1910, continued in epidemic form during the months of January and February, with the beginning of the drier weather, and possibly owing to the want of fresh pabulum, the number of cases gradually decreased and it ultimately disappeared about the end of May, after having been in the district about eight to nine months and being directly responsible for forty-four deaths.

Pulmonary Tuberculosis.—Of this disease fourteen cases were recorded with a total of seven deaths. Although every effort is made to disinfect the sputum and every precaution taken to prevent the spread of infection, home treatment still continues unsatisfactory to the patient and dangerous to the other residents, owing to the small size of the houses in which the patient as a rule lives.

Anæmia.—Seventy-two cases were attended, some of malarial origin, but a good many of the cases have been proved to be due to the ankylostomia. Instructions have been issued, in accordance with the Ordinance, for the provision of latrine accommodation at the various schools and estate villages, but the time allowed for erection has not yet expired.

Yaws.—Fifty-six cases were sent into the institution and great vigilance was maintained in attempting to rid the district of this disease. Beds at the institution are not always available and there is no law to compel those who are refused admission to come up for treatment; as a consequence nuclei for the infection of new cases continue to exist in the district, without control or supervision, and so the vicious cycle is established and the expenditure for the eradication of this disease will ever continue to be recurrent.

Anthrax.—This disease, of which there had not been a single case for many years, suddenly made its appearance again at Dougaldston Estate, the old and original infected area, and cases subsequently developed at Loretto Estate and in the town of Gouyave. Immediate steps for the suppression of this disease were taken in every case, and every possible prophylactic measure was carried out in the first place by me, and subsequently by Mr. Saunders, veterinary surgeon, to limit the infection from spreading, with the result that very few animals were attacked. It is regrettable that two animals have again been verified as dying from anthrax during the present current year and prophylactic measures have also been taken in these cases, so it is to be hoped that there will be no further recurrence. In connection with this outbreak one case of external anthrax in man was recorded which readily yielded to treatment.

The following table gives the relative mortality for the different quarters of the year:—

1st quarter	55
2nd ,, ...	33
3rd ,, ...	40
4th ,, ...	39

Sanitation and Anti-malarial Measures. The drainage of the L'Ance portion of the town of Gouyave which was begun in the previous year still remains uncompleted. The Town Board have made provision, however, for the carrying on of this important work during the present current year, and steps are at present being taken for constructing the second section of the drainage. I have no doubt that when this is completed malarial fever, which is very prevalent in this neighbourhood, will disappear to a great extent. The appointment of a sanitary inspector has been a step in the right direction and some good work has been done by the present officer, who is capable and efficient; as a result of his energies I am able to report a marked improvement in the yards of the town and also in the general sanitation of the rural portion of the district.

The water supply to the town of Gouyave was unsatisfactory on two or three occasions; the fault appears to lie with the intake dam of the reservoir, from which it seems impossible to shut off the dirty flood water of the river when heavy rains occur: on these occasions one feels very disinclined to use it even for washing purposes.

The delimiting of a pig area in the outer portion of the town, although it can certainly not be looked upon as a progressive step in sanitation, will without dubiety prove a great boon to the poor inhabitants of the town, of which there are not a few; the board, however, will have to be very vigilant in order to prevent any ill-effects, both as regards malaria and anthrax. In this line, however, much cannot be hoped for, as I am unable to say that the control at present exercised by this body over other animals permitted in the town is very creditable, as Gouyave appears to be more a pasture of some large stock farm, with animals running loose about it, than a small town with an administrative body regulating these matters, and this, too, with anthrax at their very doors of which they are cognizant.

Under head vaccination the attendance was satisfactory and only two defaulters were convicted; a total of 258 cases (successful) were performed and the district continues well protected against smallpox. The lymph continues to give satisfactory results.

R. D. O'Neale.

Colonial Medical Reports.—No. 33.—Grenada —*(continued)*.

DISTRICT No. 6.—ST. PATRICK'S.

In view of the changes affecting the population, satisfactory comparison with the vital statistics of previous years is impossible. The birth- and death-rates were normal There was but one factor in operation during the year which in some measure increased the sick-rate and mortality, viz., an epidemic of whooping cough which began in the previous year and continued during the first quarter. This was responsible for the higher death-rate during that period.

Based on the recent census the population of the new No. 6 District is estimated at 5,500.

The relative mortality in the different quarters is shown in the following table:—

Number of deaths: 1st quarter, 51; 2nd quarter, 32; 3rd quarter, 21; 4th quarter, 35.

A higher sick-rate was as usual to be noted in the wetter months.

Malarial fever was rather more prevalent. Four hundred and fifty cases or nearly one hundred more than in the previous year were treated. The numbers occurring in September and October were about double the monthly average. As a rule the cases were mild and yielded readily to treatment. Intestinal diseases also showed some slight increase. There were sixty-eight cases of dysentery treated, but comparatively few of these showed any malignancy.

Forty-seven cases of yaws were seen and, except those cases occurring in infants, were all referred to the police for transport to the Yaws Hospital.

There were fifteen cases of pulmonary tuberculosis. Gastro-enteritis among children, the result of improper feeding, occurred in its usual large numbers.

Whooping cough, as above noted, was epidemic during the first quarter. Few children under 10 years of age escaped an attack. Considering the widespread character of the epidemic the death-rate from the disease was comparatively small.

The improvements in the sanitary condition of the district which followed the appointment of a sanitary inspector were well sustained during the year.

Some permanent improvement was effected in the drainage of the towns of Victoria and Sauteurs by the laying down of concrete drains. The lower Marli lands and the Glebe lands in the town of Sauteurs have been much improved and there is less vegetation in the neighbourhood of houses generally. Rank vegetation is however permitted to remain in the water-logged areas at the mouths of the Mt. Craven and La Fortune rivers, where it is most desirable that such growths should be removed. Trees and shrubs of no economic value should all be removed from these pestiferous areas. They only provide shelter for mosquitoes and any cultivation permitted should not impede the free circulation of air.

Nothing is heard nowadays from the dwellers in Sauteurs of the hardness of the water supply. The more fastidious palates seem reconciled to the "heaviness" and the water is used for every purpose.

Some consideration was given to the question of a water supply for the town of Victoria. The Babillon Spring on the Tufton Hall Estate was examined and found to fulfil all the requirements of a good drinking water. The scheme presents no engineering difficulty and it would be a pity to delay the accomplishment of a work so very essential to the sanitation of the town.

Two hundred and ninety-four children were successfully vaccinated. Parents regularly presented their infants for the operation and seldom was it necessary to report defaulters.

No anti-mosquito measure of any magnitude was undertaken during the year. What the sanitary inspector effects in the improvement of sanitation generally must, however, be regarded as tending to prevent the spread of mosquito-born diseases. As yet no diminution in the number of cases of malarial fever has been observed.

H. BISHOP,
Medical Officer, No. 6 District.

DISTRICT No. 7.—ST. PATRICK'S.

The estimated population based on the census of April last is 6,397. Owing to the recent re-division it is not possible to give comparative figures, nor the birth and death-rates.

The usual observation was made that more sickness prevailed during the wet than during the dry season for reasons well known. But the year as a whole was one of comparative good health, no serious epidemic of any kind, with the exception of the regularly recurring influenza, having occurred.

I am inclined to attribute this improvement to the vigilance of the sanitary inspector, whose frequent visits have resulted in an undoubted improvement in the sanitary condition of the villages. This officer continues to take great interest in his work, and performs his duties very satisfactorily.

The following table gives the monthly distribution of deaths:—

	Number of deaths
January	18
February	24
March	19
April	12
May	7
June	5
July	9
August	11
September	9
October	15
November	11
December	12
Total	152

The rainfall was seasonable and abundant, and did not adversely affect health.

The necessity for the establishment of well-regulated public cemeteries is becoming more and more urgent. With the increase of population and

cultivation there is hardly any room left in the existing burial grounds, which at their best were only small plots of land intended for family purposes. So that at the present time great difficulty is experienced in some of the villages to secure suitable places to bury the dead.

A great deal would have been achieved in this direction so far as this district is concerned if a cemetery were established at Conference, and another at Mornefendue. These two places would tap most of the affected villages, and at the same time a glaring breach of ordinary sanitary precautions would be removed.

The following gives the number of cases of the more important diseases dealt with during the year:—

Dysentery, 226; malaria, 989; malignant new growths, 3; pulmonary tuberculosis, 12; syphilis, 376; tetanus, 8; leprosy, 1; yaws, 47; influenza, epidemic.

Yaws is as prevalent as ever, and will continue to be so until more hospital accommodation can be provided.

Pulmonary Tuberculosis.—Still maintains its strong position, and it will be a boon indeed to the poorer classes when the promised special hospital for cases of this disease has been erected. Imagine a consumptive being one of the eight occupants of one of our ordinary labourer's huts, 16 ft. by 10 ft., and the horrors of the situation will at once reveal themselves.

The sanitary condition of the district remains much the same as in previous years. The work of the sanitary inspector, however, is beginning to show fruit in the greater cleanliness in and around the village houses, and in the fact that all small collections of stagnant water are at once removed. And to these improvements I attribute the appreciable diminution in the number of cases of malaria.

The provisions of Section II of the Public Health Ordinance, 1910, requiring all persons handling bread, either in its preparation or sale, to secure a certificate of health from a medical officer, are excellent, but observation has satisfied me that they are not rigidly carried out, and so their object must be defeated. There are still some people baking bread who have never obtained the necessary certificate. But the great plan in the execution of the Ordinance is that whilst the head of the family generally obtains the certificate several other members assist in making or selling the bread without so doing.

The Ordinance is a good one, and in the interest of public health should be pushed for all its worth. This will tend to reduce the number of bakeries, and so the number of people handling this important article of food, and at the same time better supervision will be secured.

The attendances for vaccination have been most regular, and 292 children under 1 year were successfully vaccinated. The lymph supplied, with but trifling exceptions, gave uniformly good results.

W. A. D. Whiteman,
Medical Officer, No. 7 District.

District No. 8.—St. Andrew's.

The exodus of labourers from Grenada in search of work in Panama or Brazil has not affected this parish materially as the births and deaths show:—

	1907	1908	1909	1910	1911
Births	661	731	660	695	703
Deaths	331	400	422	459	369

About a third of the children born in this parish die before passing their fifth year—see figures given below:—

	1909	1910	1911
Births	660	695	705
Deaths of children 5 years old and under	235	256	218

The survivals are mostly a sturdy race who have defied unsuitable feeding and perhaps "unavoidable" neglect from hard-working parents from almost infancy.

Longevity of the Population.—The number of deaths of persons recorded as 60 years old and over was in—

1909	1910	1911
60	55	53

If the children who die under 5 years (from which age the maximum probable duration of life is reckoned) are deducted, it will be seen what proportion of the survivors reach 60 years and over:—

Gross Totals last Three Years.

Deaths	1,250
Less children under 5 years	709
	541
Deaths at 60 years and over	168
Deaths between 5 and 60 years	373

Whereas the chances of any one after attaining 5 years of reaching 60 years are about equal in England.

The death-rate in a wet year is generally greater than that of a dry one. Deaths from digestive respiratory and malarial diseases are all increased, the little streams which supply drinking water are contaminated by road and surface drainage, and enteric troubles become prevalent. This mortality is fairly well shown if the rainfall and deaths for the last six years are arranged for comparison.

The deaths this year are still an increase when compared with 1907. It is, of course, impossible to trace deaths by the rainfall each month as children when taken ill linger on several months.

	1907	1908	1911	1909	1906	1910
Rainfall	61·27	71·2	84·82	91·57	98·16	112·70
Deaths	331	400	369	422	444	459

Remarks on Particular Diseases that have occurred during the year.

Malaria.—The deaths attributed directly to malaria were in: 1909, 32; 1910, 59; 1911, 31.

1910 had the greatest rainfall of the last six years and therefore offered facilities for mosquitoes to propagate. The deaths enumerated above indicate a considerable amount of illness.

PREVALENCE OF SICKNESS AND RELATIVE MORTALITY IN THE DIFFERENT SEASONS.

1911	Rainfall at Mt. Horne	Deaths due to Diseases of					Labourers in their houses prescribed for
		Digestive system	Respiratory system	Malaria.	Other diseases	Total deaths each month	
January	4·83	18	15	5	14	52	768
February	5·96	13	11	6	8	38	571
March	2·37	8	9	2	10	29	698
April	2·98	8	1	4	16	29	700
May	4·56	4	4	1	13	22	751
June	15·62	5	4	2	7	18	544
July	4·91	4	8	2	14	28	711
August	8·24	11	2	2	16	31	742
September	13·49	11	6	2	13	32	689
October	5·56	9	4	2	12	27	756
November	10·02	11	7	2	13	33	790
December	6·28	11	8	3	8	30	621
	84·82	113	79	33	144	369	8,341

Yaws is decidedly less seen, but the ill-effects on the constitutions of many often remains.

Intestinal Worms. — Labourers' children are almost universally affected, adults very frequently. It is astonishing how many find a habitat in one person.

Venereal Diseases.—Gonorrhœa is very rife. In both 1910 and 1911 the stillbirths recorded were forty; venereal diseases may account for some of these, but illegitimacy and married men working abroad both operate in compelling women to labour till too near their confinement.

The sanitary inspector on his rounds calls on the inhabitants to remedy sanitary defects. In a mountainous country with roads dug along hill-sides, as fast as mosquito pools in the drains are filled up Nature resupplies her progeny with others. Drains are quickly blocked by earth trickling downwards, by the rapid growth of weeds obstructing the water course, or by a heavy rainfall ploughing holes in the soft soil. The houses of the peasantry are scattered everywhere along the roadsides except at extreme heights.

Former cane fields near the coast, now cattle pastures, swampy after rain, could no doubt be reclaimed if owners were enterprising and wealthy enough to await their transition into coco-nut groves. Such swamps exist at either end of Grenville.

The milk supply is mostly obtained from cattle tethered on accumulating dung heaps midst the cocoa (for the sake of the manure) and drawn by unclean youths. The substitution of condensed milk with limewater often arrests infantile diarrhœa.

The Public Works Department have commenced a drainage scheme. Flood water is to be drained into a tank, whence it is proposed to be pumped into the sea by wind-power.

Rank vegetation, by which is understood bush and high growing weeds, are prohibited in the town, but the luxuriant growth of varieties of the banana plant and coco-nut trees effectually bar sunlight and circulation of air and keep the soil damp. Floral and agricultural cultivation in certain defined areas of the town should be under sanitary jurisdiction and a clear space of 30 ft. insisted on round houses. Cultivation too often is used as dumping place for household waste and slops.

By-laws for condemning insanitary and structurally unsafe dwelling-houses were passed during the year. Such quarters were the refuge of undesirable characters from the country, who hindered sanitary progress. These by-laws will also have a beneficial effect in compelling owners to keep their premises in repair or lose their rents.

Abattoir.—I regret the slaughtering of cattle is still a public exhibition in unscreened private yards. Any amateur can painfully slaughter an animal, and no prior inspection of its fitness as food is made. The subject has long been under consideration.

Vaccinations.—The lymph supplied gave uniformly good results; 210 children were successfully vaccinated. The little operation is always deferred from month to month when delicate infants are brought, and this gives me additional control in watching over such weaklings.

N. S. DURRANT,
Medical Officer, No. 8 District.

DISTRICT NO. 9.—ST. ANDREW'S.

For the following reasons it is quite impossible to form any useful estimate of the population of this district. In the first place, the southern boundary was changed on November 1 from the Crochu River to the Great Bacolet River; the changes through emigration and immigration also add to the difficulty of getting any correct data. The infantile vaccinations (309) give a fair idea of the number of births, while the deaths, certified and uncertified, were 202; but this latter number only refers to my own practice and does not include those of the two private medical men. Harford Village, Lower Capitol, Grand Bacolet and Balthazar all have district boundaries running through them, so that even the registrar of births and deaths is unable to supply any accurate information on the subject.

January, August, September and October were the most unhealthy months in my district; while March, April and June were the most healthy.

Malarial fevers were the chief causes affecting the public health; there were no serious epidemic diseases to contend with in 1911. The mortality was highest in January and December, and lowest in April, June and October, but the range was not great.

The rainfall, as registered at Bellevue Estate, was 83·28 in.; this was much less than that of the previous year, which was 111 in. Although the rainfall was less, the number of malarial fever cases was larger by 59, the total number being 619. This is hard to understand until it is remembered that the majority of them were persons who were already harbouring the malarial parasites, and only required a disturbing chill, &c., to start the fever afresh. I think that the actual primary attacks were not more numerous than last year.

One case of typhoid fever occurred at La Digue; the patient was a girl, aged 17, and she recovered after seven weeks' illness. The water supply was not the vehicle of infection in this instance, for she lived exactly opposite the first standpipe of filtered water from the public waterworks.

Seventy-six cases of dysentery were treated. July and August supplied the largest number, twelve and ten respectively. Nearly all these cases occurred in parts of the district not served by the St. Andrew's waterworks.

The general sanitary condition of the district was fairly good, considering that it is a purely rural one and so did not get much money spent on it for sanitation purposes. A good deal of useful minor work was done by the Sanitary Inspector, but it is very difficult to make the average labourer appreciate the dangers of dirt and stagnant water; deaths from preventible diseases are always accepted as a Mohammedan's "Kismet."

Overcrowding is still the great trouble among the labouring classes, especially as the condition is not ameliorated by ventilation; it would seem that the night air is so heavily charged with "Jumbies" that every door, window and crevice has to be hermetically sealed with rags, &c., to keep them out.

Vaccination was very thoroughly performed in this district during 1911. Infants to the number of 309 were successfully operated on, and a large number of emigrants also sought its protection.

Observations regarding the Health of the Inhabitants of the District.

Respecting the health of the inhabitants of No. 9 District, I fear the general tone is low; the children, especially, are anything but healthy; poor feeding is the root of the whole trouble. This poor feeding of the children is easily accounted for, when it is borne in mind that the average Grenada labourer, with children, only makes 5s. a week; such a small sum, without a garden for provisions, is not a "living wage." The complaints that the children suffer mostly from are nearly all connected with the digestive system, gastro-enteritis and intestinal parasites being their chief diseases.

The quantity of worms (especially the *Ascaris lumbricoides*) that some children can harbour is something astounding; fifty or sixty "round worms" from a four-year-old child is a frequent occurrence.

I know that the "Ankylostomum" is the fashionable worm in Grenada just now, but I am perfectly certain that it does not cause half the harm that the common "round worm" does. After thirty years' medical experience in this colony I cannot call to mind a single death directly attributable to ankylostoma, but I have seen many deaths from the *Ascaris lumbricoides;* very old people suffer from them also.

In dealing with ankylostomiasis the treatment generally commences at the wrong end of the ladder. When a patient is found to be anæmic from ankylostoma he is sent to hospital, where he is scientifically treated with thymol, &c.; when cured, he returns to his home and soon becomes reinfected; once more he goes to hospital to be again "cured."

This process will go on indefinitely until attention is paid to the environment of the patients; for it is the soil surrounding their dwellings that requires the treatment: in many damp localities, where the houses are encroached upon by cultivations, the earth is laden with the embryo worms, and any person walking on it barefooted runs a risk of being infected. In the old sugar days the soil had frequent chances of getting dried up and aerated, and so did not afford the worm a suitable nidus for its eggs and larvæ; but to-day, under the shade of cocoa and nutmeg trees, the soil is always damp and ready for the requirements of the parasite.

If the yards of the dwelling-places, in certain localities, were kept free from vegetation, allowing the sun and wind to dry them up, very few people would require to be specially treated for ankylostomiasis; this disease has a natural tendency to cure itself, and it is the reinfections that cause all the mischief. Under the present mode of dealing with ankylostomiasis, hospital beds are in continuous use for the treatment of this one disease to the exclusion of far more serious cases.

Malignant New Growths.—I am glad to be able to state that cancer did not appear to be on the increase; the cases seen were nearly all in women, and the uterus was the organ most frequently attacked.

Pulmonary Tuberculosis.—Consumption is still gaining ground in Grenada, but, as suitable places for treatment and isolation are soon to be built, I expect to see some improvement in this direction.

Venereal Diseases.—Both syphilis and gonorrhœa were frequently met with among the lower classes, but the permanent injury caused by these diseases is certainly less serious than that experienced by persons suffering from them in colder climates; it would appear that free perspiration has a certain eliminating effect with respect to syphilis.

The want of properly trained midwives has become a most urgent question. I have not granted a certificate in midwifery for many years; those women who applied for them were hopelessly ignorant, and could not even understand the necessity of cleanliness in their special work.

Burials.—More bodies were buried outside the cemeteries and proper burial grounds than inside;

but as the local authorities are now offering more conveniences and inducements to the public, I have every hope that improper interments will be less frequent in future.

H. J. Lee Bennett,
Medical Officer, No. 9 District.

District No. 10.—St. David's.

The estimated population for District No. 10 cannot be given, as the district includes a large part of the parish of St. Andrew's, and a part of the parish of St. David's is included in No. 2 District. For the same reason other figures appertaining to vital statistics cannot this year be set down here.

For the purposes of a general survey it might be mentioned that the birth-rate throughout the parish of St. David's was of normal standard and the births numbered 287.

The deaths registered as having occurred in the parish during the same period amounted to 108. The death-rate was the smallest recorded for many years, and that was principally due to the exceedingly small sick list for the year. This parish and district have never been known to be so healthy for many years.

The prevalence of no disease was specially accentuated during the year; there was a little of all the usual yearly troubles, such as gastro-enteritis among children, influenza, diarrhœa, malarial fevers, dysentery, &c., but none assumed epidemic proportions and none deserves special mention.

The cases of yaws met with were sent to the Yaws Hospital. Several cases of this malady were discovered and reported to me by the police and district sanitary inspector.

Pulmonary tuberculosis is still with us. There was a movement some time ago of providing an institution for the isolation and treatment of people suffering from this dreadful complaint; recently nothing has been heard of the scheme. It would certainly be conferring the greatest good on the inhabitants of Grenada by establishing such a hospital; and, in my opinion, I know of no public work, from a sanitary and public health standpoint, that is nearly as useful or urgent.

A few cases of ankylostomiasis were met and were treated with thymol with good results. This disease, as far as I am able to judge, is not gaining ground in this district.

The general sanitary condition of this district during the year was exceedingly good and nothing calls for special observation.

The vaccinations performed during the year amounted to 228 and the lymph supplied was excellent in quality and came regularly.

G. N. Alexis,
Medical Officer, No. 10 District.

Carriacou District.—Belair, Carriacou.

The population as taken by the last census was 6,886. Births during 1911, 244; deaths during 1911, ninety-one; birth-rate during 1911, 35·4 per 1,000; death-rate during 1911, 13·21 per 1,000; number of stillbirths, nine.

The birth-rate was higher than the previous year, 35·4 per 1,000, as against 27·7 for 1910.

The death-rate was also higher, 10·09 per 1,000 for 1910, as against 13·21 per 1,000 for the year under review.

Malarial fevers were prevalent in January and also November and December. One case of blackwater fever was treated in January. The last cases of an epidemic of whooping cough, which raged at the end of 1910, were seen in January, forming the tail end of the epidemic. Several cases of pneumonia were seen in February; they were of a mild type and no death occurred. March was particularly a healthy month; a few cases of malarial fever were seen.

Venereal diseases kept cropping up with persistent regularity as the sloops returned from the south. The great majority of the nine stillbirths was due to venereal disease in either one parent or the other. I regret to report that there are to-day many innocent children who are paying the price of their parents' dissolute habits.

Gastro-enteritis and diarrhœa, among children and adults respectively, were fairly prevalent in April and May and again in August and September. In children the cause must be due to the manner of feeding adopted, irregularity in quantity and irregularity in quality.

Tuberculosis of the lungs and other parts of the body still continues to make an insidious progress among the poorer classes, and I hope the day is not far distant when patients so affected may be sent to an isolation hospital, so as to reduce the spread of this dreadful malady.

The sanitary condition of the district has been undoubtedly good during 1911, and very few cases could be directly traced to insanitation.

Sporadic cases of dysentery were seen, and when the conditions of the water supply is considered the natural immunity of the average Carriacouan to water-borne diseases becomes apparent.

Anti-malarial measures consisted in stocking the swamps and ponds with "millions" fish, the clearing of brushwood and weed around dwellings, and a free and liberal use of quinine.

The number of successful vaccinations for the year was 146. The lymph was of uniform good quality.

Edwin Wells, M.B.,
Medical Officer, Carriacou District.

Colonial Medical Reports.—No. 34.—Gold Coast.

MEDICAL REPORT FOR THE YEAR 1910.

By W. H. LANGLEY, M.D.

Principal Medical Officer.

General Health.

In Ashanti and the Northern Territories the rains commence earlier and end later, with a break during July or August, which is more marked the farther north the observations are taken. In the Colony this break is less noticeable, and the rainy season as a whole is shorter.

Malaria begins to rise slowly soon after the rains set in, and reaches its greatest height in August. There is then a fall, and a second but smaller rise in October, followed by another fall.

The prevalence of this disease is, of course, in direct proportion to the anopheline rate. It does not begin to rise until some time after the commencement of the rains, because there has not yet been time for any great number of mosquitoes to be bred and become infected. During the heavy rains, moreover, stagnant pools suited to the habits of the anopheles are less numerous and constantly being flushed out by flood water, and it is, therefore, only when the rainfall is decreasing and these pools remain for longer periods that the great rise in the malarial rate takes place. The small secondary rise after the subsequent fall may be deceptive, but is possibly due to the nearly equal rainfall from August to October, which would be sufficient to maintain many suitable pools at a fairly constant level. The suddenness of the falls must also be attributed to some extent to increased vigour in the prosecution of prophylactic measures.

The great prevalence of diseases of the bronchi and lungs during December and January is due to the chilling effects of the Harmattan wind and the irritation set up by inhalation of the fine particles of sand it carries. The later rise from July onwards is accounted for by the general dampness and the frequency with which the people are drenched by the rains.

The rise and fall of gastro-intestinal diseases coincides fairly well with the rainfall, and is mainly due to pollution of the water supplies by surface water from the villages, combined, to some extent, with lowered powers of resistance to disease during the unhealthiest season.

Health of Government Officials.

The health of European officials was not so good as in the preceding year. Although there was a decrease in the number placed on the sick list, there was a considerable increase in the number of days during which officials were ill, and there was also a slight increase in the daily average. Both the invaliding and death-rates were higher, the former nearly double that of 1909.

General European Population.

The general European population consists of: (i) Government officials; (ii) employés of trading firms, employés of mining companies; (iii) missionaries.

The strength of the first group is steadily increasing year by year; that of the others, however, varies considerably, and much difficulty is experienced in obtaining as accurate figures regarding it as are available in the case of Government officers. The system in vogue is unsatisfactory. It depends for its success on the courtesy of individuals; but, although their courtesy is not called in question, such a method of obtaining statistics is bound to prove faulty. A suggestion was recently put forward that arrivals and departures other than those over the seaboard of the Colony might be regarded as a negligible quantity, and that what is required is an accurate record of embarkations and disembarkations. This could be provided by the agents of the different shipping companies or the pursers of ships landing and embarking passengers; in existing conditions, the required information is only obtainable through the courtesy of these officials. It has been suggested that the question of some form of legal enactment should be considered.

General Native Population.

The subject of compulsory registration of births and deaths has been occupying the consideration of the Government.

At the few centres in the Colony where the system of issuing and recording "burial permits" obtains the number of burials recorded was 2,099, as against 1,611 in 1909; it may be assumed, therefore, that, as regards the Colony itself, the sickness rate for the year under review decidedly increased.

Gaols.—The general health of convicts was not good. Although the number undergoing sentences was less than in the previous year, the sickness and death-rates were higher.

Lunatic Asylum.—The mortality rate was high, but the deaths occurred among very old standing cases or those recently admitted in an enfeebled condition, the causes being, with one exception, those usually common in this class of patient, *e.g.*, epilepsy, heart failure, inanition, dysentery, and pulmonary diseases. The number in the latter group was proportionately small, most of the deaths

Return of Diseases and Deaths in 1911 in

Ashanti, Northern Territories, Gold Coast Colony.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	17	1	17
Anæmia	182	—	182
Anthrax	—	—	—
Beriberi	38	6	37
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	64	—	63
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	372	3	371
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	505	25	503
Enteric Fever	3	1	3
Erysipelas	10	—	9
Febricula	348	—	348
Filariasis	—	—	—
Gonorrhœa	621	1	621
Gout	9	—	9
Hydrophobia	—	—	—
Influenza	6	—	6
Kala-Azar	—	—	—
Leprosy	40	—	39
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	18	1	17
Tertian	20	—	20
Quartan	—	—	—
Irregular	18	1	18
Type undiagnosed	1,291	3	1,291
(*b*) Remittent	1,412	7	1,409
(*c*) Pernicious	20	5	19
(*d*) Malarial Cachexia	7	—	7
Malta Fever	—	—	—
Measles	36	1	36
Mumps	27	—	27
New Growths—	—	—	—
Non-malignant	194	1	194
Malignant	7	1	7
Old Age	—	—	—
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	2	—	2
Rachitis	1	—	1
Rheumatic Fever	614	1	614
Rheumatism	1,430	2	1,430
Rheumatoid Arthritis	—	—	—
Scarlet Fever	1	—	1
Scurvy	—	—	—
Septicæmia	17	3	17
Sleeping Sickness	52	12	51
Sloughing Phagedæna	—	—	—
Small-pox	208	1	207
Syphilis	—	—	—
(*a*) Primary	124	—	122
(*b*) Secondary	255	1	255
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	6	—	4
Trypanosome Fever	—	—	—
Tubercle—	30	9	30
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	508	—	508
Yellow Fever	11	10	11

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	1,725	3	1,720
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	43	4	43
(*b*) Other Diseases	231	4	231
Digestive System—	8,646	20	8,643
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	587	—	587
Eye	1,529	—	1,529
Generative System—	—	—	—
Male Organs	480	2	480
Female Organs	243	3	243
Lymphatic System	568	—	568
Mental Diseases	12	1	12
Nervous System	861	10	859
Nose	104	—	104
Organs of Locomotion	1,011	—	1,011
Respiratory System	4,658	52	4,656
Skin—	—	—	—
(*a*) Scabies	337	—	337
(*b*) Ringworm	132	—	132
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	175	—	175
(*f*) Other Diseases	6,075	2	6,062
Urinary System	199	7	198
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	3	—	3
(*c*) Other Injuries	5,990	16	5,982
Parasites—	452	1	447
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	17	—	15
Filaria medinensis (Guinea-worm)	948	—	948
Tape-worm	274	—	274
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	1	—	1
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	15	—	15
Surgical Operations—	—	—	—
Amputations, Major	3	—	3
,, Minor	1	—	1
Other Operations	132	1	132
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

having occurred during the rainy season. The exception referred to above was a case of trypanosomiasis.

Food and water supplies were ample and of good quality.

As in previous years, such patients as were fit to work were employed in gardening, clearing the asylum precincts of bush and weeds, carrying water and collecting firewood. 3,930 lb. of cassava were produced in the asylum gardens.

Laboratory.—The only regular laboratory work done during the year was examining rats for plague bacilli. There were occasional analyses of water, and some microscopical work for purpose of diagnosis and determination of malarial indices among children. Excepting a period of six weeks in November and December it was not possible to detail a medical officer exclusively for laboratory work, but during this period the unavoidably interrupted preparation of small-pox vaccine was gone on with; the results were encouraging. The first supply of lymph reached its destination within four weeks of its manufacture and gave a success percentage of 15·09; the second, after a period of six weeks, gave a success percentage of 98·1. There is reason to believe that most of the first supply was rendered inactive by heat during the process of sealing the tubes for which at the time there were no proper facilities.

Hospitals and Dispensaries.

The construction of new native hospitals was completed at Tamale, Tarquah, Akuse, and Winnebah; and a special fly-proof hospital was built at Anum, in the Volta River District, for the treatment of sleeping sickness and the isolation and observation of "suspects."

The number of cases treated in the hospitals and dispensaries in the Colony was: European, 900; native, 26,908; as against European, 1,056; native, 29,293, in 1909.

Accra.

The later rains in November and December of 1909 probably account for a rise in the general sickness and malaria rates which occurred in January, and the exceptionally heavy rainfall in June for the later elevation of the malaria rate.

MEDICAL REPORT OF COOMASSIE AND THE PROVINCE OF ASHANTI.

The health of the Europeans stationed in Ashanti during the year has been good.

The total number of Europeans on the sick list amounted to 75.

There was one death of a non-official European from blackwater fever, who was brought in to Coomassie from a mine in a moribund condition, and three were invalided.

The health of the troops during the Camp of Exercise held in the early part of the year was good; four officers only suffered from minor complaints.

The European Hospital has been kept in an efficient state throughout the year, and has been much appreciated by patients, who formerly had to be treated in their own houses in any illness.

The health of the native staff was most satisfactory throughout the year. One clerk was invalided, and no deaths occurred.

Drs. Brabazon, Atkinson and Hunt have been in immediate charge of the native hospital during the year. The large majority of those who attend for treatment are soldiers from the regiment suffering from ulcers of the feet and legs, although there is a gradual increase of natives from the surrounding villages as compared with former years. Much good work has been accomplished.

Prison.—The health of the prisoners has been very fair; there was one death from bronchitis. There were 63 cases under treatment in the infirmary, the prevailing diseases being febricula, diarrhœa, rheumatism, bronchitis and abscess. The yard and the cells were kept in a clean and good sanitary state. The food of the prisoners was inspected at different times, and found to be satisfactory.

There were between 80 and 90 known cases of sleeping sickness in the Province, and an average of 15 have been under treatment with atoxyl injections at Coomassie; the subjects attend weekly at the hospital for this. No deleterious effects on the sight have been observed or complained of, although complaint is made of the pain at the seat of injection lasting for a number of days. A small isolation hospital for this disease is in course of erection, and will be ready for occupation in a month or two.

Small-pox.—This disease has been prevalent throughout the year at many places in the Province; no doubt a good deal of it is due to the native habit of inoculating direct from persons suffering from small-pox to healthy people, with the idea that the disease is produced in a mild form; but whether this is so or not it is difficult to say, as the chiefs or their people will give no information as to mortality, but the custom, no doubt, keeps the disease alive.

During the year there were 37 admissions to the segregation camp, of whom 11 died. Vaccination with lymph from Europe has been carried on as much as possible, but the people do not show anxiety or readiness to have it done; there have been 2,881 successful vaccinations done in Coomassie during the year.

Native Staff.—Instruction has been given to the hospital pupils and junior staff by the medical officers and nursing sister in hygiene, dressing of wounds, and other hospital duties; also, first aid and stretcher drill, to contingents of soldiers, by the medical officers.

The sanitation of the town of Coomassie has been well looked after with a staff of about seventy scavengers in daily employment. There are now five incinerators in constant operation, burning the sweepings and rubbish of the town, and three for the regimental lines, and the cleanliness of both town and cantonment may be considered satisfactory. The burnt refuse from the incinerators is being used to fill in the swamps below the town.

Colonial Medical Reports.—No. 34.—Gold Coast—(*continued*).

Few mosquitoes are observed in the town or cantonments, but constant supervision is required to prevent the people keeping water standing in barrels or pots in their houses. The visitation of houses during the month of December revealed the presence of larvæ in a little over 2 per cent. Between thirty and forty cesspits have been found to be in existence in the premises of different people in Coomassie, and which are now being abolished.

The water supply is abundant and good. During the year eleven wells have been covered and cased with cement, and hand pumps fitted on to them.

A number of surface street drains have been completed, and as funds permit these will be gradually extended, but a lot of work is still necessary in this direction in the town.

Owing to the population of the town being much increased of late, the present slaughter-house is too small to meet requirements now, and it is under consideration to have it enlarged.

The vegetable garden has been most productive, and the produce much appreciated by the white officials; it no doubt contributes to the good health enjoyed by the Europeans stationed here.

Meteorological.—The rainfall for 1910 was exceedingly heavy, 70·89 inches fell, as compared with 55·74 in 1909.

C. B. Hunter, S.M.O.,
Acting Provincial Medical Officer.

THE NORTHERN TERRITORIES.

Medical Report.

Out of a daily average European population of 22·37 thirty-four were placed on the sick list. One invalided and one death occurred; this is a great improvement on the health of the previous year, in which 50·99 officials were placed on the sick list from all causes; three invalided and three deaths took place out of an average daily population of 22·62.

I attach prevalent diseases from which Europeans suffered: Abscess, 1; colitis, 1; chronic diarrhœa, 1; debility, 1; accident (knocked down by bull), 1; bilious remittent fever, 1; blackwater fever, 1; boils, 1; acute dysentery, 1; acute orchitis, 1; enteritis, 2; hepatic congestion, 2; injury to foot, 1; lymphangitis, 1; obscure abdominal inflammatory condition, 1; paresis of wrist (result of injury), 1; ptomaine poisoning, 1; remittent malaria, 11; remittent malaria and congestion of liver, 1; tape worm, 1; thecal abscess, 1; wound of foot, 1.

Non-Official Europeans.—One Catholic Father died at Navarro from blackwater fever. This Missionary had been in the country for over five years. With this exception the health of the European non-officials was satisfactory.

Native Officials.—The average daily number of the Government clerks throughout the Protectorate averaged 50·23; and out of this total twenty-three were placed on the sick list, three were invalided, and no deaths took place.

The average number of days spent on the sick list shows a large increase on last year, this being caused by the length of time some of the patients had to remain in the Northern Territories before it was considered advisable to allow them to undergo the long journey to the coast.

Native Troops.—The company of the Gold Coast Regiment was transferred early in the year to the new headquarters of the North-Eastern Province; and since their arrival at that station, the health amongst all ranks has been excellent. Out of a daily average of 140·46, there was no invaliding, and no deaths occurred.

Northern Territories Constabulary.—Detachments of this force were stationed at nine different points throughout the Protectorate, and from all stations satisfactory health reports have been received. During the year five men were invalided and three deaths took place. When it is considered the duties these men perform in all weathers these figures are low. No epidemic occurred amongst Constabulary or I Company of the Gold Coast Regiment, stationed in the Northern Territories.

No serious epidemic occurred amongst the natives of this country during the year. Slight outbreaks of small-pox took place in several districts, but were easily dealt with, as the inhabitants now raise very little objection to having the infected ones isolated; and in several cases it was done without any instruction being given.

In some districts it is the custom, when a case of small-pox arises in a village, for the Chief or Headman to inoculate all adults; and sometimes the inhabitants of a neighbouring village will visit an infected one, for the purpose of having all the people inoculated. In this way the disease is kept up in the outlying districts.

Dr. Beringer, in his report on a tour through a certain portion of the Southern Province, reported several cases of sleeping sickness. Throughout the rest of the Protectorate three cases were under treatment, all of which ended fatally.

Meteorological.—The rainfall was about the average, 46·21 inches; and except that the Harmattan set in earlier than usual in the first week of October there is nothing particular to remark about the meteorological conditions of the year 1910.

The supply of vegetables in all the gardens has been well up to the average. The following articles were procurable during most of the year: Tomatoes, carrots, lettuce, French beans, and radishes.

The water supply at all stations throughout the Northern Territories has undergone improvement, wells being sunk at most of the stations from which a good supply of pure water is obtained.

Sanitation.—The sanitation of the headquarter stations and villages in the immediate neighbourhood of same is kept in good order. This is only accomplished by constant supervision; and, if relaxed for any length of time, the people soon return to their filthy habits.

H. Tweedy,
Provincial Medical Officer.

SANITARY REPORT.

Trypanosomiasis.—During 1910, about fifty cases of sleeping sickness were treated in the different hospitals, and eleven deaths recorded. Towards the end of the year 107 cases were reported under observation or treatment by the medical officers in various districts.

Glossina palpalis is universal and widespread in almost every part of the Colony, from Anum on the eastern border to Berekum and Sunyani on the west, extending into the Gonja district, and even probably as far north as Gambaga. Dr. Kinghorn reports it pretty universal throughout the northern and western provinces of Ashanti and the Banda District. He states that the extent of the disease in the Western Province bears a strict relation to the comparative frequency of *G. palpalis*. In Wenki 5 per cent. of the inhabitants were found to be infected.

On the Togoland border Dr. Claridge states that the whole district is adapted to the tsetse-fly and that *G. palpalis* is present everywhere.

Dr. Beringer points out the widespread prevalence of this fly throughout the Gonja District, but whether this be the ordinary *G. palpalis* or *G. palpalis* var. *Wellmani*, would appear open to question. Whole villages in this district are reported to have been deserted by the natives on account of sleeping sickness prevalent there.

Dr. Rice has called attention to the prevalence of the fly all along the Coomassie-Kintampo road, and it has long been known to be exceedingly plentiful in the Kintampo District. It would appear, therefore, that *G. palpalis* is far more widely spread throughout the Colony and Protectorates than any other variety of tsetse. It is found almost universally throughout the whole of the forest and semi-forest country.

Taking into consideration the widespread distribution of *G. palpalis* it seems extraordinary that trypanosomiasis has not made greater headway or taken on an epidemic form. Whether human trypanosomiasis is endemic and the natives to some extent become immune, or whether we are dealing in this Colony with a strain of infection of low virulence, are hypotheses to neither of which I care to commit myself.

The seriousness and the possibilities of sleeping sickness, as far as the Gold Coast is concerned, are now well recognized, and every effort is being made to cope with a situation that at first sight strikes one as being well-nigh superhuman.

It would not appear that the time is yet ripe for compulsory segregation of the infected. One's efforts must be directed for the present to the intelligent clearing of bush round villages, fords, ferries, &c., in fly districts, to the erection of segregation camps and hospitals, and to gaining the confidence of the native, and persuading him and educating him as to the good to be derived from attending these hospitals. The Chiefs should be held responsible for these clearings, and some system of compulsory notification of the infected should be insisted on.

During the year £4,000 was specially voted for sleeping sickness preventive measures.

Three special service medical officers were appointed, some excellent work was done, and much useful information obtained as to the distribution of the disease and the fly.

It is extremely difficult to start a proper system of prophylaxis until the distribution of trypanosomiasis and *G. palpalis* are more definitely mapped out.

A sleeping sickness hospital was completed and opened at Anum during the early part of the year. It consists of two mosquito-proofed rooms, measuring respectively 31½ ft. by 18 by 12 and 15½ ft. by 18 by 12 ft., and capable of accommodating eight to ten patients. The staff consists of a medical officer and a dispenser pupil. The attendance was disappointing. For many months the wards were entirely empty. The native seems to make light of the disease, and it is difficult to persuade him to come for treatment. A sleeping sickness hospital was also erected at Kintampo. Here there were eight admissions and three deaths during the year. A fly-proof room was set apart in the Native Hospital at Coomassie for the treatment of these cases. There were four admissions and two deaths in the twelve months.

Slaughter-house Blood Smears.—During the last half-year 1,181 blood examinations were made of cattle killed in the various slaughter-houses.

In eighty-seven of these cases trypanosomes were found—a percentage of 7·36. In twenty-six cases other forms of parasites were noted. Of cows, 35·97 per cent. were found to be suffering from trypanosomiasis, sheep 14·54 per cent., goats 15·42 per cent. No trypanosomes were reported to have been found in pigs.

Yellow Fever.—In the early part of the year there were ten cases of yellow fever amongst Europeans in Seccondee, nine of which were fatal. Three deaths were also known to have occurred amongst natives. The first notified case of the epidemic occurred on April 12, and the last death took place on May 22.

On July 15 a death from the same cause was reported from Axim, and on July 18 the last case of the epidemic was brought into Seccondee from 12½ mile camp.

The Cape Coast Town Council passed some excellent by-laws with a view to obtaining further powers for dealing with mosquito larvæ, but these were disallowed in deference to the Attorney-General's opinion that they were "ultra vires."

An Ordinance to provide for the destruction of mosquitoes throughout the Colony was brought under the consideration of the Legislative Council.

Filariasis.—Only six cases of elephantiasis were reported under treatment during the year.

There were three cases of *Filaria loa* recorded.

Although it cannot be said that any special preventive measures have been set on foot with reference to this disease in particular, still the fact has not been lost sight of that the prevention of filariasis practically resolves itself into protection from mosquito bite. A rigorous campaign against

mosquitoes of every variety is at present being conducted.

Plague.—It is pleasant to report that the past year has been entirely free from this epidemic. The lessons of the previous year have, however, been taken to heart. Rats are being regularly and systematically examined. The Clayton machine is being periodically used to keep these vermin in abeyance. A mechanic has been provided for the Clayton machines, and regular bi-weekly Claytonizing of warehouses harbouring rats will be carried on in Accra, Seccondee and Cape Coast.

Small-pox.—One hundred and sixty-two cases are reported as having been treated in hospital, and forty-two deaths were recorded—a mortality of 25·09 per cent., as compared with 217 cases and a mortality of 17·05 per cent. in 1909. This represents but a small porportion of cases that actually occurred, as a large number are concealed in the bush and never heard of. At the close of the year sixty-one cases were under treatment.

In Ashanti there were frequent small and scattered outbreaks, but it is impossible to obtain reliable information, and statistics are out of the question.

In the Birrim District in August 159 cases were isolated. Two medical officers were dispatched there, and some 5,369 vaccinations were performed and many sanitary improvements carried out in the district. At the latter end of the year there was a small outbreak in Tamale.

25,399 vaccinations were performed throughout the Colony during the twelve months; of these, 14,069 were successful, and 11,330 unsuccessful. In the previous year 13,614 individuals were vaccinated.

Whenever an outbreak has been reported medical officers have been immediately sent to the district to take the necessary steps to stamp out the disease, and native vaccinators have also been sent to patrol and vaccinate in the district, but the ways of the native are inscrutable. At times they will flock to be vaccinated, at others they will stampede and nothing will persuade them to return.

There can be no doubt that the practice of inoculation carried out by natives in some districts has been responsible for a large number of deaths and for the introduction of small-pox into fresh villages.

Dysentery.—The records of the various hospitals show that 479 cases of dysentery were treated, with a mortality of 42 = 8·76 per cent., as compared with 328 cases in the previous year and a mortality of 4·26 per cent. Amongst European officials there were eleven cases, none of which ended fatally.

Intestinal affections are very common amongst the natives, and taking into consideration the great carelessness displayed in most villages and many towns with regard to the pollution of the water supplies the wonder is that intestinal troubles are not very much more prevalent and fatal. A great deal of attention has been paid recently, and a large amount of work done in protecting the water supplies from pollution and contamination. In all the principal towns the majority of wells have been protected, and this work is being proceeded with as rapidly as funds will admit.

One cannot expect, for many years to come, to see a proper drainage scheme and a pipe-borne water supply laid on in these towns—with two exceptions—but it is hoped that in the course of a few months there will not be a single well that is not properly protected—at any rate, as far as the principal towns are concerned.

Throughout the Colony and Protectorates, at the end of the year, 34 public wells and 674 private ones had been protected against surface contamination.

Enteric.—Only four cases were treated in hospital during the year, and one of these was fatal. Three out of the four were European officials. No special preventive measures have been adopted in this direction, as hitherto enteric has been exceedingly rare in the Colony.

Ankylostomiasis.—Only eighteen cases of ankylostomiasis were recorded. *Ankylostomum duodenale* is known to be prevalent. In 1905 the presence of *Necator americanus* amongst the natives of this Colony was demonstrated. Several cases of uncinariasis have been reported from the Aburi district. There is reason to believe that *Uncinaria americana* (*Necator americanus*) is more widespread than it is generally reported to be, and probably we shall find that with the more systematic examination of the stools recently instituted uncinariasis is by no means an uncommon disease.

The protection of the wells against surface contamination, at present being proceeded with, will undoubtedly aid in the diminution of this and other helminthic diseases.

Tæniasis.—The hospital records show that 273 cases of cestode infection received treatment. No other particulars are given, but when one takes into consideration how universally the pig is kept and fed upon, it is only reasonable to suppose that the majority of these cases were cases of *Tænia solium*. It is the general opinion than tæniasis is very much more common amongst natives than the above figures would lead us to suppose.

Until pigs are more or less confined, and the very primitive methods of "conservancy" practised in most bush villages is improved upon, it is difficult to see what measures can be taken to abate this evil. It is a matter that will probably right itself *pari passu* with the advance of sanitation in the bush villages.

Bilharzia.—Only three cases of bilharziosis were recorded during the year. No special preventive warfare has been waged against bilharzia hæmatobia (*Distomum hæmatobium*). The large amount of work done, however, in protecting water supplies from contamination must have a good effect in this direction.

Guinea-worm.—There were 944 cases recorded in the various hospitals during the year. Many attempts have been made to trace the sources of infection, and when successful the infected pools have been dealt with. As a rule it is not easy to trace an infection to its source, information is

difficult to obtain and generally misleading. You may provide the native with a good water supply, but you cannot insist on his drinking that water and that alone. His salvation, as far as guinea-worm is concerned, rests on his education and his realizing how he gets the guinea-worm.

Sewage Disposal.

There is no water-borne disposal of sewage in the Colony. The latrine pans are for the most part emptied into the sea or trenched. An improved, more sanitary form of latrine was started during the year. The floor was raised and graded so as to allow of the washings being collected in a pan placed outside, instead of saturating and polluting the ground around, as was formerly the case. A large number of latrines have been reconstructed in accordance with this improved type, and the remainder are being altered as rapidly as funds and labour will allow.

During the year 72 new public latrines were erected, 46 for males and 26 for females. There are 682 private latrines.

Disposal of Refuse.

The common methods of disposal of refuse were: filling up holes, burning, dumping in the sea, dumping on marked-out dumping grounds.

A large number of incinerators have recently been, and are being, erected. It is intended that all the larger towns shall be provided with two or three incinerators, mostly of the beehive type. In future, therefore, the greater part of the refuse will be got rid of by burning in these incinerators. There are at present 43 destructors and about 195 dustbins in use.

Some 4,329 headloads of rubbish are daily removed by scavengers, and 38 carts are in addition in daily use. About 21 loads of tin cans and other incombustible material are daily removed from houses and compounds and buried.

Water Supply.

There can be no doubt that one of the crying needs of the Colony is "improved water supply."

Accra and Seccondee have now commenced their schemes for a pipe-borne supply. It will probably be some time before other towns are similarly favoured, but it is imperative in the meantime that such water as is available should be protected from contamination. In this direction a large amount of work has been done during the past year. The unfortunate outbreak of yellow fever was not without some good results—money was voted and drinking-water sources protected on a scale that would not otherwise have been possible.

Only one town at present (with the exception of one or two of the mining villages) boasts a pipe-borne supply, and that is Obuasi. The town is provided with twelve stand-pipes, laid on by the mine.

The drinking water in the towns is for the most part either storage rain-water or water from shallow wells. In the bush villages the supply is usually from adjacent streams.

There are 58 public wells in the Colony and Protectorates, and 1,224 private ones, 130 public tanks and 854 private ones, and 3,043 barrels. Of these various water receptacles 80·50 per cent. have now been properly protected. In a short time there will be but few that have not similarly been dealt with.

Drainage.

There is little or no sub-soil drainage. About 8,608½ yds. of masonry drains were constructed during the year, and 6,041 yds. of ditches dug and graded.

Extensive drainage schemes are at present under consideration for Accra, and it is proposed to spend large sums of money on Seccondee. In both these cases it will be necessary to complete these schemes before the arrival of the pipe-borne water supplies now in course of construction.

Clearance of Bush.

Owing to the Yellow Fever Preventive Vote allowed to the different towns and the greater number of scavengers in consequence possible, more bush clearing was done during the latter half of the year than I suppose has ever before been known in the history of these towns.

Some 4,531,743 square yds. are reported to have been cleared, but probably this does not represent anything like the amount of clearing actually done. In addition to having the interior of the town cleared, the aim in view is to have the entire outskirts also well cleared to the extent of at least 100 yds. This is a fairly large undertaking and requires time. Many of the towns up to the present have been well cleared round to the extent of 50 yds. or more.

Most of the medical officers have during the course of the year given a series of lectures or demonstrations to their dressers. School-teachers and others outside were at liberty to attend, and in some instances this opportunity was taken advantage of.

No information on teaching in schools is obtainable from the Director of Education.

Colonial Medical Reports.—No. 35.—China.

General Summary of Medical Reports from His Majesty's Consulates in China, for the Year ending September, 1911.

By Dr. DOUGLAS GRAY.

British Legation, Peking.

The following short note will explain the principal objects of these reports:—

The data concerning the presence or absence of zymotic diseases in different ports will contribute much, in the light of the latter-day bacteriological knowledge, to the study of epidemiology, which is all the more important in view of the rapid and increased steam-ship inter-port communication and opening of railways through the Empire.

For those who are in China, or contemplate coming to it, and for commercial undertakings, it is well to know the health conditions of the treaty ports, as also the habits of life, diet, &c., which experience has shown to be necessary for the well-being of foreigners during their residence here.

Information can also be gathered from medical observation of Chinese diseases and method of treatment.

A general survey of medical matters cannot fail to be of interest and use to the profession at home, and will add to the better equipment as regards knowledge of local diseases to practitioners in China.

Introduction.

The general impression gained from a study of the medical reports sent from seventeen treaty ports of the health conditions during the year ending September, 1911, is that, during the period under review, the public health among foreigners has been very good, better than for many years past.

It has also been fairly good among Chinese in the central ports. But, as regards the Yang-tsze valley, the inexorable law of nature that "pestilence" follows famine has been again observed in the virulent epidemics of typhus and relapsing fever which have been very prevalent among the crowded groups of famine-stricken refugees and wanderers rendered homeless by the heavy, almost unprecedented autumn floods from the river and its tributaries. Starvation, following the destruction of crops, and its ensuing lowering of resistance to disease and infection, has caused the deaths of many thousands. Various reasons have been given for the immediate cause of the present political trouble, but one might argue with great reason that the reflective effect of famine on the mass of the people with its concomitant circumstances of high sick and mortality rates is in the highest degree provocative of general unrest. In an agricultural Empire such as China is, with 80 per cent. of its inhabitants tillers of the soil, the vast majority of them know little and care less for political vagaries, and as long as crops are plentiful they are willing and able to pay the usual taxes without troubling much as to the ultimate distribution of the sums collected. There can be little doubt but that the revolutionary outbreak, taking place, as it did, in the Yang-tsze valley with its ruined crops and consequent rise in the price of rice, the mainstay of Chinese diet, found, at its beginning, the people distressed in mind and body, and ready to listen to the incitements of political agitators.

These remarks may be somewhat beyond the province of a medical report, but they are prompted by the observations made so frequently by the consular medical officers of the apathy and indifference to public health improvement on the part of the local authorities throughout the Empire. Tuberculosis is noted as on the increase, and is becoming a veritable unchecked scourge. Typhus, relapsing fever, cholera, small-pox, and bubonic plague appear annually and claim a heavy toll. The problem of overcrowding in Chinese cities is one that is very difficult of solution, but that a great amelioration could be effected by the Chinese themselves, the efforts, necessarily more or less limited, of foreign doctors and medical missionaries in China can be cited as proof.

Efficient drainage, pure water, isolation of infected cases and their contacts, ventilation of dwellings: these are the four outstanding factors requisite to good public hygiene, and they are all neglected in every Chinese city. The East has much to learn from the West in this respect, and it may serve a good purpose to lose no opportunity in pointing out the need of more active measures. In most places the lower classes are more ready to seek foreign medical aid than the gentry and *literati*, many of whom, in spite of lessons to the contrary, are curiously wedded to the Chinese system of medicine, which, with its superstitious notions and erroneous ideas, remains in the same state of unscientific knowledge as it was over a thousand years ago.

At the same time there has to be noted a steady annual increase in the demand for foreign medicines, which is being only partially responded to by British drug merchants, the most active traders being the Japanese. Patent medicines are now extensively advertised and the consumption of them is yearly growing greater.

Specific Diseases.—Intestinal parasites, tuber-

culosis, diarrhœa and dysentery, malaria, venereal diseases are endemic and, in the order named, prevalent all over the Empire.

Pneumonic Plague. — This epidemic, already reported upon, raged over Manchuria, Shantung, and Chih-li provinces last winter, resulting in a loss of over 65,000 lives. The Chinese authorities, when once they had become alive to the danger, showed most commendable energy in the way they grappled with the disorder. A certain amount of preparation to guard against a similar occurrence has been made, and it is not probable that another epidemic of this variety of plague, should it arise, will be allowed to spread to the same extent as the last one.

Bubonic Plague during the past year has not been so prevalent as usual. It appeared in Canton (200 deaths per diem), Amoy, Pakhoi, Shanghai, and Foochow, but there is no mention of its having occurred in any inland ports or in the Yang-tsze valley.

Cholera.—The past year has been singularly free from epidemics of this disease. Probably more accurate methods of diagnosis have resulted in a clearer definition between choleraic diarrhœa and the more virulent and fatal *cholera Asiatica.*

Typhoid Fever has been less prevalent among foreigners owing to the better sanitation of the various concessions. If every European and American coming to reside in China where typhoid is undoubtedly endemic were to first submit to anti-typhoid inoculation, this disease, which annually causes a number of deaths, more especially among comparative new comers, would become much less of a menace than it at present is. The statistics of the United States of America Government, recently published, showing that among 12,644 soldiers vaccinated against typhoid only five cases of the disease occurred with no deaths, while in the remainder of the army 418 cases occurred with thirty-two deaths, are sufficiently good proof of the preventive power of this vaccine against typhoid fever.

Typhus Fever and Relapsing Fever.—Both these diseases have been very prevalent and caused an incalculable number of deaths among the Chinese. They are the result of bug infection in enfeebled constitutions, and are rarely met with among foreigners. The conditions of life under which they occur are at present beyond the power of medical science to ameliorate: the question is not one of cure but of prevention, and this can only be brought about by public works involving a large expenditure of money to diminish, or, if possible, avoid altogether the present uncontrollable flooding of the Yang-tsze River and its tributaries. Total prevention seems a counsel of perfection, but it is mainly a matter of finance as to whether the annual loss of many thousands of taxpayers' lives, and the destruction of good crops do not cost the nation more than the expenditure of the necessary funds. The economic progress in Egypt that has followed the expert management of the Nile should be a striking object lesson to China, and is proof enough of the capabilities of scientific engineering to effect a great improvement and lessen the appalling loss of life which is yearly becoming a more pronounced feature of increasing gravity in the Yang-tsze valley. No figures are available, though from the accounts to hand the sickness and mortality caused by typhus and relapsing fever alone exemplify in marked manner the urgent need for public sanitation.

Small-pox.—In treaty ports and wherever foreigners are, the benefits of vaccination are being made more and more known, and the epidemics of this disease (which in some places here resemble those of the middle ages in Europe) are being correspondingly limited. During 1911 there appears to have been less small-pox than has ever been noted before.

Malaria.—All the varieties of this disease are met with in Mid- and South China. In the provinces of Chih-li and Shansi, and in Northern Shantung and Kansu which comprise North China, it is but rarely found. The question of malaria in China depends largely on quinine treatment and less on mosquito prevention, for the paddy fields of the rice-growing districts form the most suitable mosquito breeding grounds that could be devised. Wherever rice is grown in China, there is malaria most prevalent.

The foregoing summary refers to diseases most commonly met with. It may not be without interest to mention some of the most notable instances of diseases from which this vast Empire is comparatively free as regards its native population:—

Appendicitis.—Very rare. Some doctors of long standing and wide Chinese medical experience have never met with a case, though they are occasionally called to deal with it in foreigners.

Sprue.—Though so frequent among foreigners, especially in Shanghai, no definite case of this dangerous disease has ever been recorded in a Chinese.

Liver Abscess.—Scarcely ever seen among them, notwithstanding the high dysentery rate.

Trichina Spiralis.—I can find no record of Chinese human infection, and even among pigs trichinosis is extremely rare.

Tapeworms.—These worms which have so wide-spread and common a distribution over the rest of the globe, are seldom found in Chinese except in those of them who eat foreign food.

Nervous Diseases.—Locomotor ataxia and chorea are very infrequent. Having regard to the fact that syphilis is one of the commonest and worst-treated diseases in China, the almost total absence of true tabes dorsalis and general paralysis of the insane is remarkable. In this connection one might add that in China alcoholism is very uncommon.

Rickets is scarcely ever noted, probably owing to the fact that Chinese children are all breast-fed.

Acute Rheumatic Fever in children is likewise lacking, and this accounts for the noted freedom from organic heart lesions.

This list is capable of extension, but I have limited it to those diseases about which there is unanimity of medical opinion.

The national extension of Chinese railways may yet prove to be an important factor in the spread of disease. By such lines as the Canton-Hankow Railway, populous centres (*e.g.*, Hankow, Peking, and Tien-tsin) will be brought within a few days of Canton, which is an endemic plague centre. An outbreak of cholera at Hankow which will, when the railway is finished, be distant only thirty-six hours from Canton, would thus be made more easily communicable than is at present the case. It is to be hoped that efficient measures of medical inspection will be devised to meet this new sanitary danger.

A most noteworthy instance of the power of railways to spread an epidemic was afforded by the Manchurian lines (during the recent outbreak of pneumonic plague), which brought down through the Great Wall into the Northern Provinces many hundreds of potentially infective coolies during the incubation stage of the disease, in addition to numbers already infected.

A new menace to the health of the people has, during the past few years, appeared in China, and is annually claiming a greater number of victims. I refer to schistosomiasis. No specific remedy has as yet been found for it, but the disease is being closely observed by carious medical workers. Its prevalence may be appreciated from the observations made by Drs. Hart and Houghton (*vide* the Wuhu Report), that in the Anhui province there are some magistracies "wherein practically every other one of the farmers is infected." A separate article at the end of this report, embodying the studies of Dr. J. A. Thomson, of Hankow, will be found an important contribution to the scanty literature of this grave problem.

Amoy.

Population 400,000.

The report from this port, including the native city and Kulangsu, the foreign settlement, shows a much better state of health than that of the previous year. The same diseases have been prevalent, but to much less extent.

Although the health officer was obliged to declare plague to be epidemic, in consequence of the rule imposed by the Imperial Maritime Customs, that four cases daily are sufficient for that purpose, irrespective of the size of the population, it is doubtful if the declaration was justified. During August, the weekly returns of plague deaths diminished rapidly to nil. There has not been a single case noted since the end of August. From first to last, beginning on February 12, 1911, there have been eleven fatal cases on the Island of Kulangsu, and 435 deaths in Amoy city and its suburbs.

Considering that the population numbers anything between 200,000 and 300,000, living amid insanitary surroundings unsurpassed anywhere else in China, these figures cannot be regarded as denoting a severe outbreak. Quarantine of ten days from port to port was imposed on arrivals from Amoy to Singapore on June 17, but by some oversight was not notified in Amoy till July 7. This might have caused a certain amount of unnecessary trouble, but shipping arrangements were made to meet the requirements of the situation.

Cholera.—There has been practically no cholera in Amoy this summer, the health officer having personally seen only one case of typical complaint. There have been quite a number of cases of choleraic diarrhœa, many proving fatal. The same name "lao-t-'u" is used for both complaints indiscriminately.

In spite of Amoy being free from the infection, the port was declared infected by cholera by the Straits authorities in consequence of an outbreak on board the steamship *Seang Choon*, which occurred after the ship had arrived at Singapore. fourteen days after she had left Amoy, though the period of incubation for Asiatic cholera is from three to six days. This outbreak was unmistakably due to the presence on board of Hakkha emigrants from Swatow. These coolies, whose villages are notable hotbeds of cholera, for some reason refuse to use the distilled water supplied them by the ship, and bring on board with them for drinking purposes *en route* chatties full of water from their native places. This is in a foul condition when they start, and becomes worse with keeping.

There have been no other diseases of an epidemic nature. The health of the foreign community, in spite of the trying summer, has been on the whole good, though there was a certain amount of seasonal gastric trouble.

J. Moorhead, L.R.C.P.

Canton.

This is the most important Chinese city in the Empire. It has a population of 2,500,000, and is about ninety-five miles by river from Hong Kong. The foreign population lives on Shamien Island, apart from the native city, which is and always has been very overcrowded. But for the yearly visitation of plague, the health of Canton may be considered to have been satisfactory during the past year. Since the laying of a supply of water a few years back throughout the native city from the Canton waterworks, there have been far fewer cases of enteric, cholera, and dysentery in the city of Canton.

During the summer of 1911 in the native city a few cases of supposed cholera occurred at odd times, but there has not been any epidemic of this disease.

Bubonic plague appeared in epidemic form in April and increased during the months of May and June, and, whereas it has usually subsided and often entirely disappeared in June in former years, it continued till July this year. During the height of the epidemic in May the approximate number of deaths was estimated at 200 per diem.

It is impossible, Dr. Davenport says, under

existing circumstances in Canton, to secure any accurate statistics. There are always a certain number of cases of malaria, mostly of the benign tertian form, in Canton. A number of Chinese have been sent into hospitals suffering from malignant malaria. A considerable number of these were coolies employed in construction work on the Canton-Hankow Railway. It is interesting and pleasing to note that, in spite of the greatly increased population of the foreign settlement of Shamien in recent years, there was far less malaria and typhoid fever, from which foreign residents very frequently suffered in the past. Only one case of typhoid fever (a Japanese subject) occurred during the past year.

The improved health generally throughout Shamien may be attributed chiefly to improved administration and the enforcement of more strict sanitary regulations, and, in spite of the long summer, Shamien, the foreign settlement, can now compare very favourably with any town in the tropics.

E. C. Davenport, M.B.Lond., M.R.C.S., L.R.C.P.; Hermann Balean, M.D., B.S.Lond., F.R.C.S.Eng.

Changsha.

Population 500,000. The capital of Hunan. On the Hsiang River.

There have been more cases of illness among foreigners this year than in the previous year, but the ailments were for the most part not of a serious nature. For the first time in several years no case of typhoid has occurred among foreigners. Dr. Hume has given twenty-four protective injections of anti-typhoid vaccine and is advising its use in the community. There was discomfort only in one case. Summer diarrhœa was the most common affection. Impure water is the most fruitful source of infection at Changsha.

Urticaria and tropical boils were noted in foreign residents, as also two cases of oxyuris vermicularis infection.

Among Chinese the table of maladies does not differ from those noted in last year's report to any great extent. Infections with intestinal parasites, particularly ascaris lumbricoides, hookworms, pinworms, and *Trichocephalus dispar*, continued to be common. More cases of infection with *Schistosomum japonicum* were observed. No genuine cases of typhus fever, plague, beri-beri, anthrax, or leprosy were seen during the summer.

Small-pox, an epidemic of moderate severity, visited Changsha early in spring. Small-pox is endemic here, and this epidemic was one of the exacerbations from which the city suffers every now and then. Dr. Yen quotes the following case to show how little is yet known by the Chinese as to the infectivity of the disease. He was called to see a child supposed to be suffering from measles. On arrival he found the child had small-pox, and on inquiring was told another had just died from the same disease, and one slave girl had just survived an attack. Another one was in the pre-eruptive stage, and the mother, who was in the stage of crustation, was having her hair, which was well entangled in scabs, dressed by a maid, who, to Dr. Yen's surprise, had not yet been infected.

Out of 500 surgical cases seen in one division of the Yale Mission Hospital at Changsha, 83 or 18·8 per cent. had surgical forms of tuberculosis. Dr. Hume compares this incidence with the figures of the Johns Hopkins Hospital in Baltimore, U.S.A., where only 0·61 per cent. of surgical cases are tubercular.

A warning is given against foreigners bathing in the Siang River, as the endemic area of *Schistosomum japonicum* is steadily spreading. It has now been noted at Siang-yin, forty miles below, and at Hengchow, above Changsha.

Vaccination is still little practised by Chinese in this province. Inoculation is extensively carried out. It is done at childhood, and one inoculation is said to ensure protection for a lifetime.

E. H. Hume, M.D.; F. C. Yen, M.D.

Chinkiang.

Population 168,000; 160 miles from Shanghai at the junction of the Grand Canal with the Yang-tsze River.

In the first half of the year under review the health in Chinkiang was "not at all satisfactory." There were six cases of typhoid fever in the small foreign community, and an epidemic of typhoid among Chinese, "which undoubtedly originated among the thousands of famine refugees." As the conditions of water supply were very primitive, food and milk under no supervision, it was only natural any slight oversight in individual precaution should cause the high typhoid rate. Dr. Urbánek makes the following statement as to infection in dogs:—

"It is interesting to note that just before the outbreak among human beings there was an epidemic among dogs, first among Chinese curs and then dogs kept by foreigners. I had the opportunity of making seven autopsies on dogs, and have been astonished to find quite typical ulcerations in the bowels (ileum), infiltrated glands in the peritoneum, big tumour of the spleen, and excessive parenchymatous degeneration of the heart, liver, and kidneys. Ulcerations and infiltrations were in the ileum, solitaire folliculi, and Peyer's patches—in a few words, the typical pathological picture of typhus abdominalis. Death in most cases was due to septicæmia, as all but one had perforation and peritonitis. Clinical symptoms, as far as I could find out, kept on from fourteen days to three weeks. I am sorry I neglected to obtain a culture from the spleen; it would have been of great importance to ascertain whether the bacilli were identical with the enteric bacilli (Eberth, Gaffky, Loeffler)."

Real famine typhus has also been prevalent. A journey was made along the southern section of the Tien-tsin-Pukow Railway to Hsu-Chao Fu to verify rumours that plague had broken out. The epidemic was due to typhus fever, and there was a very high death-rate from this disease and starvation.

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THE rumour as to plague started on account of the fact that the starved people, having no resistance, when infected with typhus died in one or two days, before it was possible to make any diagnosis. "The starving population stripped in many places the bark from trees, and hundreds of people have been seen digging out rotting roots of the earth to satisfy their craving hunger." Two cases of anthrax and one of œdema malignum came under notice.

In the second half of the year the health of the foreign community showed improvement, though Dr. Balean reports that typhoid, dysentery, diarrhœa, boils, malaria, and, owing to considerable and rapid variations in temperature, bronchitis and catarrhs were all prevalent. One case of beriberi was noted in a foreigner.

Amongst the Chinese population the most numerous affections treated were malaria, dysentery, diarrhœa, tuberculosis, beriberi, septic affections, syphilis, and gonorrhœa.

The type of malaria found to be most prevalent was tertian, and few cases of the malignant type have occurred. There was marked freedom of the concession and surrounding country from cholera, which Dr. Balean attributes to the relative scarcity of water-melons, very few being obtainable after July on account of the flooded condition of the Yang-tzse valley in general. A few cases of cholera, however, occurred in the native city during July.

The adoption of surface drainage, which is now completed in almost all the lots of the concession, and the care and attention that is being devoted to scavenging and the removal of nightsoil will do much to improve the health of the population.

M. URBÁNEK, M.D.

CHENGTU.

In sending the first medical report from Chengtu district, Dr. R. B. Ewan gives an interesting reference to the physical features and climatic conditions of Western Szechuan.

The Chengtu plain is surrounded on all sides by mountains and hills of varying altitude. Standing on a spur of the northern range the plain looks in some respects like a huge basin, through which the canals of its world-famed irrigation system are seen to wind like silver ribands as far as the eye can reach.

The physical appearance favours the usually accepted theory that the Chengtu plain was originally a large inland lake, the waters of which in the course of ages cut their way through the range of mountains which now form the famous Yang-tsze Gorges.

One of the first things to strike a new arrival in this part of Szechuan is the unusual number of dull and sunless days, and the unexplained humidity of the atmosphere—in the latter feature resembling a seaport rather than a far inland district. There is no doubt a close relation between the moisture and the lack of sunshine, but no satisfactory explanation has yet been given. Travellers say that it is not at all unusual in crossing the pass which divides Szechuan from Yunnan to find the Szechuan side covered with mist and fog, while the Yunnan side is bathed in sunshine. While the thermometer does not register unusually high, the moisture in the atmosphere makes the summers very trying to most foreigners, and all who can spend a month or six weeks on the hills. Even the Chinese feel it, and during the hot weather lose energy and become anæmic. Owing to the flatness of the country the drainage is poor, and the level of the "ground-water" high. In the wet season it is not at all uncommon to have the water rise in the wells to within 2 ft. of the surface. This no doubt accounts for not a little of the sickness (fever, &c.), which often breaks out at these seasons.

The diseases of Chengtu and district do not materially differ from those of Szechuan in general. Indigenous leprosy is practically unknown, the very few cases met with invariably hailing from other provinces. Cholera occasionally breaks out. Smallpox, malaria, tuberculosis, and venereal diseases in all their forms are prevalent. In Dr. Ewan's experience diphtheria has been a negligible quantity, though he has heard of an outbreak this year thirty miles from the capital. He has not in the course of thirteen years' practice in Chengtu found a case among Chinese which he is prepared to diagnose as typhoid.

Cerebro-spinal meningitis is not uncommon. The Chinese doctors claim that it prevails every year during certain winter months. They also recognize it as an almost invariably fatal disease. It is a rather noticeable fact that out of five adult deaths that have occurred in the Canadian Methodist Mission, since its establishment in West China, two have been from cerebro-spinal meningitis, one from typhus, and one from cholera. Anthrax is unknown.

Measles, rubella, whooping-cough, and influenza are common, but no scarlet fever has been noted. There seems to be an unusually large percentage of enlarged tonsils and adenoids in the children of foreigners born in this district. Last summer, on the Kuan Hsien Hills, both foreigners and Chinese suffered from a somewhat peculiar fever characterized by high temperatures, slow and feeble pulse, and gastric disturbances. The onset was typhoidal, but the course shorter, and did not readily respond to medical treatment. Although Dr. Ewan has met with several cases of appendicitis among foreigners, he has only seen one case of mild catarrhal appendicitis in a Chinese who had been acting as cook for foreigners during a number of years.

Dr. Ewan belongs to the Canadian Methodist Mission, and has been busily engaged in erecting a large four-storey building, which, when complete, will accommodate from 135 to 160 patients. There

is also a fine new hospital, erected three years ago by the American Methodist Episcopal Mission, with accommodation for 100 beds.

The Roman Catholics, who have occupied Szechuan for nearly two hundred years, have recently opened a new hospital. Whilst the wards are only modified Chinese buildings, the operating equipment is of the best. The French Government has also supplied an X-ray plant, which is used in connection with the training school. I am indebted to His Britannic Majesty's Consul-General, Mr. W. H. Wilkinson, for the following report of their work:—

The French Mission médicale in Szechuan is paid partly out of the "allocation spéciale" for scientific missions abroad, and that forms part of the annual vote for the Ministère des Affaires Etrangères, and partly by the Government of Indo-China. The total sum from the two Governments allocated to Szechuan is placed in the hands of the French Consul-General at Chengtu and distributed by him.

There are two establishments (*a*) for Chungking (*b*) for Chengtu. The doctor at Chungking is also engaged for the Hôpital de Tchongking, maintained by the Catholic Mission at that city, and his chief work is on behalf of the Catholic missionaries.

At Chengtu there are two doctors and two "infirmiers"—all four being French. One of the "infirmiers" is paid specially by Indo-China, the other by the French Ministry of Foreign Affairs. The doctors are both members of the Army Medical Corps, and are married.

One of them, Dr. Mouillac, is "médecin consultant de l'Hôpital chinois," a dependency of the Ecole militaire médicale, where the professor is a Japanese. He has also the direction of the Catholic Mission Hospital, receiving a small salary from that mission. He is allowed private practice, and is much sought after by the Chinese.

The other, Dr. Esserteau, is to have the direction of the Institut bactériologique, now in process of erection on premises belonging to the Catholic Mission, outside the North Gate. This institute is a sort of bacteriological laboratory started by the French Government in accord with the Catholic Mission, and forming, as it were, a complement to their hospital. The funds necessary, and, above all, the materials, are furnished by the French Government, notably the vaccine, sent from Tonquin.

At present the institute will confine itself to vaccination, though later on other serums, as, for instance, the antidote to hydrophobia (Pasteur's serum) will be studied and applied.

Should Chengtu be made a treaty port, the French Government will either buy out the interest of the Catholic Mission in this institute or will convey their own interest to the mission.

The personnel of the institute is to include a doctor, who must be an expert in bacteriology, an "infirmier" (a Frenchman), and a number of Chinese pharmacists.

Opposite to the buildings of the institute is a hospice, conducted by sisters of mercy. No physician is attached to the hospice, but one or two rooms will be reserved for interesting bacteriological cases. Until his leave is due next year, Dr. Esserteau from the institute will attend to such patients.

Both Dr. Mouillac and Dr. Esserteau send in monthly reports to the French Consul-General, combining these into annual reports, which are forwarded to the Governments of France and Indo-China.

R. B. Ewan, M.D.

Chungking.

Population over 400,000. On the Upper Yang-tzse, in the province of Szechuan.

The health of the foreign community has been good. By the end of September the great heat (99° F. to 102° F. in the shade) ends, and the foreigners bring back their families from the hills. A tornado of wind and rain, accompanied by a severe thunderstorm, breaks up the hot atmosphere, and after a day or two of more rain the summer is at an end. The most prevalent diseases (amongst Chinese) have been hemiplegia, chronic bronchitis, cardiac dilatation, and dropsy, especially among water-carriers (Chungking being very hilly), anæmia in girls and women, phthisis, rheumatism, asthma, typhoid fever, and gonorrhœa. Trachoma is the commonest eye disease. In noting that tetanus neonatorum occurs in many children, Dr. Wolfendale says the cause is due to the Chinese practice of wrapping the placenta and cord around the baby (and all together in warm clothing) and waiting till they decay off.

A small epidemic of small-pox occurred in Chungking. As drugs can only be obtained once (or at most twice) a year, with reasonable hope that the order may arrive safely on account of the Yang-tsze rapids to West China, I compiled and sent a list of useful drugs which can be readily obtained in native medicine shops.

R. Wolfendale, L.R.C.P. & S.Edin.

Foochow.

Population 650,000. The capital of Fokien province.

No regular reports have been received from this port, but in the beginning of this year a report was supplied by me dealing with a part of 1910. It is, however, included as showing the health conditions prevalent there. There were no cases of serious illness of a remarkable nature among foreign residents. In spring and autumn there were numerous cases in the foreign community of influenza and muscular rheumatism. Diarrhœa was common during summer, while only one case of dysentery was accounted, and for several years there has been no case of typhoid fever. The majority of residents migrate in summer to the

mountain tops at Kuliang, where the highest temperature in the shade seldom exceeds 82° F. The temperature at Kuliang is normally 10° or 15° F. below that in foreign houses in Foochow. Among Chinese there is a good deal of general illness, but the only disease of markedly prevalent nature was Asiatic cholera. Influenza, measles, mumps, whooping-cough, typhoid fever, and diphtheria are reported as frequently recurring among natives.

Plague, which first appeared in 1894 and every year during July, August, and September, raged with violence until 1907, has since then been present in decidedly sporadic form in Foochow city and its immediate surroundings. During the summer of 1910 I only came across one case of plague. Plague has never visited any of the tea districts. Typhoid fever has proved more fatal among foreign residents from 1879 to 1910 than any other disease.

T. Rennie, M.D.

Hankow.

Situated at the junction of the Han with the Yang-tsze River. In addition to a large foreign community, this important trade centre, with an annual trade value of over 1,000,000,000 taels, has a population of 800,000, all living in narrow, overcrowded lanes.

The climatic conditions were favourable during the past year. The summer was unusually cool, but there were floods which submerged a considerable part of the British concession. The native and foreign health was exceptionally good, the best in my recollection. An important sanitary improvement has been the introduction of a thoroughly modern water system constructed by a British sanitary engineer. The water is taken from the Han River above the native city of Hankow, and after sedimentation, aeration, and filtration, chemical and bacteriological tests show it to be of a high grade of purity.

No cholera was noted this year, and this freedom is in accordance with Indian experience that floods and a high subsoil water-level mean less cholera, and *vice versa*. It is seldom that a summer passes without a more or less extensive cholera epidemic in Hankow, but during the past summer of rain and floods there appeared to be a complete absence of this disease. Plague was also absent; typhus and relapsing fevers, up to the time of writing the report, were less prevalent than usual.

Paratyphoid and typhoid-like fevers are of frequent occurrence, and are no doubt caused by an organism of the colon group, though the typhoid-like fevers do not agglutinate with typhoid or paratyphoid emulsions. They run a mild course. Several cases were seen of fevers which agglutinated with emulsions of *B. melitensis*, although clinically the symptoms were not very characteristic of Malta fever. Diarrhœa and dysentery are very common. Of the latter disease, the catarrhal type is most often met with. Acute bacillary cases are less common, but amœbic dysentery is frequently seen. Tuberculosis is very prevalent among Chinese, but rare in the foreign community. Tetanus often occurs in accident cases. Anthrax—only one case, in a foreign patient, has been noted since 1909. Malaria, formerly very common, has now become rare owing to the much greater area of land which has been raised, laid out in streets, and drained. Benign tertian is the most usual form; quartan is less common; malignant tertian is variable, raging with epidemic fury some years and almost absent other years. Kala-azar is present, but appears to be sporadic so far, though I think that if splenic puncture were performed on many of the cases diagnosed as chronic malaria, the presence of this disease at out-patient clinics would be more fully appreciated.

J. A. Thomson, B.Sc., M.B., Ch.B.

Ichang.

Population 60,000. About 1,000 miles from the coast up the Yang-tsze River. A port of growing importance.

In the first half of the year under review the outstanding feature was an epidemic of cholera which was present in the months of November and December. Two of the three foreigners who became infected died. Many Chinese were attacked and the death-rate was said to be very high. The notable thing about this outbreak is the season at which it began, and the fact that at such an unusual season of the year for the occurrence of such an epidemic its source could not be determined. In the latter half of the year cholera was entirely absent. Small-pox was conspicuous by its absence during the winter. The Chinese are increasingly availing themselves in Ichang of the protection afforded by vaccination. Malaria was exceedingly prevalent, and a greater number of Chinese have sought treatment for it during the winter than in former years. They are now well aware of the efficiency of quinine, which is much sold in the streets. The commonest type is ordinary tertian, and the next is æstivo autumnal, while quartan malaria is comparatively seldom seen. There were many cases of amœbic dysentery. As for appendicitis, I have never seen a case in a Chinese. Plague and beriberi were absent.

There has been a severe epidemic of phagedenic ulcers, which occurred mostly among those coolies who during the spring suffered from relapsing fever. The history given was usually that of a slight injury, and in the cases seen early there is a small area covered with a yellow grey patch of necrosed skin, while the tissue around is inflamed and swollen. This rapidly breaks down, and in about seven days a round, sharply defined sore is formed. This is covered by a thick slough, and gives rise to a good deal of foul discharge. The slough separates in from seven to ten days, and usually the ulcers heal rapidly. The patients were all anæmic.

Elephantiasis.—Two cases of this disease were treated by the operation of lymphoplasty with fairly good results. There was marked disappearance of the swelling.

Phthisis.—This and other forms of tuberculosis in my opinion are coming more and more into evidence. What is certain is that the Chinese seem to be an agreeable soil for the growth of tubercle bacilli, and what is equally certain is that those in authority ought to make provision for the treatment of those cases which are a danger to the community. I note on the part of the Chinese an absolute indifference and inactivity towards this matter.

In Ichang there is a short continued fever lasting three to five days, which may probably be phlebotomus fever due to sand-fly bites. There have been several cases noted of "river fever" amongst the European population which may prove to be schistosomiasis, but as yet the positive proof of the ova in the stools has not been observed by him.

A. GRAHAM, L.R.C.P. & S.

NANKING.

Abstracted from reports by Drs. W. E. Macklin and M. Urbánek.

Population 400,000.

The reports received do not mention much of interest with regard to the health of the foreign community with the exception of the extraordinary prevalence of malaria, for which the destructive floods which started so early and kept on so long are mainly responsible. Dr. Urbánek states that "the disease was in Nanking and Pukow practically universal, and I do not think that any foreigner can have got off without an attack." The malaria was a malignant type, and in one district, seventy miles from Nanking, called Ming Kwan, "nearly every case became icterus and even icterus gravis."

Dr. Macklin says in his report that "malarial fevers are very common. Usually quartan forms are observed in the winter and early spring, and crescent form in the summer and autumn. Frequently a continued fever is seen; that is probably the cerebral type." There are few, if any, surface drains in Nanking; they are mostly foul under-drains that do not run.

The use of quinine is becoming very popular among the Nankinese. Beriberi has been common of late. One camp of soldiers who used southern rice was badly affected. Dr. Macklin notes a case of fulminant beriberi. Small-pox remains evident, though the Chinese generally believe in and practise vaccination, but they use human lymph. Inoculation is now rarely done; "foreigners usually get small-pox in a very virulent form—as confluent, or the hæmorrhagic type." With regard to the question of prevalence of appendicitis, Dr. Macklin is of opinion that, while it is not so common as at home, he has observed cases of this disease among Chinese. The important affection, schistosomiasis, has been studied in Nanking for the past three years by Dr. R. C. Beebe, who finds it fairly common. Some of his cases came from the north of the Yang-tsze River. Fishermen were the class mostly affected.

Famine, typhus, and relapsing fever were the cause of thousands of deaths in and around Nanking.

PAKHOI.

Situated in the Gulf of Tonquin, this is the most southerly consular port on the coast of China.

The health of the town of Pakhoi for the past twelve months has been, as compared with other years, undoubtedly good, though there is room for great improvement were the drainage of the town given adequate attention.

Small-pox and typhus fever have been entirely absent. Malarial fevers: the simple benign tertian is the usual type, though a malignant tertian is occasionally seen. Malaria is common, and the anopheles mosquito finds abundant chance of breeding in the open drains of the town. I note it as interesting that the European residents at Pakhoi, except those who have lived in other parts of China, do not suffer from malaria, and would point out that this is probably due to the fact that their houses are all away from the town on high ground with not much surrounding vegetation and no pools in the vicinity. This port is regarded as one of the "foyers" of plague in China. It was first reported here in 1886, and every year since then there have been a certain number of cases, the year 1910 being one of the worst on record. No rat or preventive measures of any kind are taken by the people, although they recognize that the discovery of dead rats in a house is very often connected with one or more of the occupants being attacked by the disease. During the past year there have only been between fifty and sixty cases. At the neighbouring city of Lienchow, however, for some weeks the epidemic was exceedingly virulent, as many as forty to fifty deaths occurring in one day, and the total number was probably over 1,000. Other isolated towns and villages suffered badly, notably the town of Kotah, three miles east of Pakhoi; though having only a quarter of the population of the latter, the number of plague cases was greater there than in the town.

Beriberi appears to be limited to sporadic cases, and I have not specially noted it as attacking any one class. I have not seen a case of undoubted appendicitis since I came to China in 1906. Only a few cases of cholera, not more than twenty, have been noted this year. There is a high prevalence of tubercular cases, phthisis, tubercular joints, and tabes mesenterica. Venereal affections are very numerous, both syphilis and gonorrhœa in all their forms. Syphilitic enteritis in children yielding to hydrarg. cum creta would account for most of the cases of infantile diarrhœa.

Cases subject to attacks of mania are commonly seen; melancholia never. I have also never met

with a case of general paralysis of the insane, though I have occasionally seen disseminated sclerosis and locomotor ataxia. The commonest eye affections in Pakhoi are trachoma, entropion, corneal ulcers, and pterygium. This observation applies equally all over China.

Once again one would put on record the conviction that a simple system of drainage for Pakhoi could be readily devised and, if adopted, would materially improve the condition of this town from a health point of view. It is regrettable that all offers of assistance made to the Chinese officials have so far met with no acceptance.

H. Gordon Thompson, M.D., F.R.C.S.Eng.

Peking.

During the year ending September, 1911, the health of the Chinese and European communities was, as compared with other years, good. It is noticeable throughout the city that public sanitation is being more efficiently carried out and main drains are being periodically opened and cleansed. The wide main streets with their open, bricked side drains readily carry off the surface waters, and locomotion is rarely interrupted nowadays during the rainy season. Municipal scavengers pass up and down the lanes gathering débris and offal, and the number of public latrines is annually increasing.

Foreigners.—Intestinal catarrh, due to *B. coli communis*, bronchitis and sporadic influenza, were the most prevalent diseases. Insomnia and neurasthenia are not infrequently noted. The health of the crowded *quartier diplomatique* shows a steady annual improvement, mainly due to two factors—pure water and better drainage. In most of the legations and business places septic tanks are now installed, and attention is also being turned to the supply of pure ice, the lack of which has hitherto been such a fruitful source of disease.

The past summer was exceptionally cool, and those residents compelled to remain inside the city walls were able to do so with less physical discomfort than is usually the case.

Chinese.—The epidemic of pneumonic plague last winter touched Peking very lightly; there were eighteen cases, which all died. During this time the sanitary department of the police kept a strict register of every death, which showed an average of thirty-eight deaths per diem in a population of 700,000. This, however, was at the healthiest season of the year, and does not include child mortality, which remains exceedingly high—over 40 per cent. The number of infant deaths is so great that it is beyond individual burial, and the small bodies are simply wrapped in matting and placed in carts which go through each district collecting the bundles, which are afterwards thrown *en masse* in a hole outside the city gates.

There have been no epidemics beyond the annual summer outbreaks of diarrhœa and dysentery. The incidence of small-pox is gradually diminishing, largely as a result of the growing popularity of vaccination. Numbers of the people suffer during the summer from febrile attacks lasting from three to seven days, often longer. In spite of many blood examinations made by various observers no plasmodia have been discovered as yet, and the diagnosis of phlebotomus fever, due to sand-fly bites with an ultra-microscopical blood germ, is now being increasingly given to such cases.

It would be difficult to over-estimate the seriousness of the tuberculosis scourge. It is the most important death factor in our midst. Every facility is given to its spread in a household by the rooted ideas the Chinese have as to exclusion of fresh air and the possibility of an affected person "catching cold" from an open door or window.

The intensive system of agriculture whereby two crops are raised each year causes a large demand for nightsoil, which is a valuable commodity. The Oriental sees no objection to the daily passage through every lane and street of wheelbarrows and buckets carrying the ordure to depôts outside the walls, which explains the efficient, if not æsthetic, manner in which the public disposal of sewerage is carried out in this vast city, situated as it is in the middle of a big plain with no effluent waters into which drainpipes could be emptied.

G. Douglas Gray, M.D.Edin.

Shanghai.

The annual health report issued by the Municipal Council differs from those of other treaty ports in the important respect that more definition is given to disease rates by the statistics collected by the Sanitary Department. Notwithstanding the large extent of its foreign settlement the public health of Shanghai, no doubt owing to better facilities, is managed more satisfactorily than in the other ports. The Medical Officer of Health, Dr. A. Stanley, with the aid of Drs. A. Moore and Noel Davis, and a staff of four inspectors and twenty assistant inspectors, keeps up a systematic examination of the whole settlement, and is able to carry out prophylactic measures in a way which is well reflected in the comparatively low mortality rate when that of other cities is taken into consideration. In a population of 13,536 foreigners and 483,005 Chinese the death-rate from all causes was 20·2 per 1,000 foreigners and 17·5 per 1,000 Chinese.

Last year there were six human cases of plague which was ascribed to the increase of rat infection in one of the sanitary sub-districts, which borders on a pestiferous district under Chinese control, where no precautions are taken. The incidence of small-pox was considerable. Forty-six cases were notified among the resident foreign community, of which thirteen were fatal. Among Chinese there were 304 deaths from it, as compared with 143 and 863 the preceding two years. There were many cases of choleraic diarrhœa, but no case of true cholera was found where the diagnosis was confirmed by the public laboratory. Typhoid fever remains an important sanitary factor in Shanghai; there were twenty-

three cases of it, with sixteen deaths. In nearly all the cases where the origin was investigated obvious breaches of the rules of health, as laid down in the public health notice, were observed. There were no deaths registered from the Malta fever, and the case mortality from diphtheria is steadily diminishing, probably owing to a more general use of antitoxin, which is now one of the staple products of the laboratory, and is issued free to any indigent patient.

Scarlet fever, practically unknown in the Tropics, appears to have come to Shanghai to stay since its introduction by foreign immigrants in 1900. As would be expected with a recently introduced disease, against which evolution has afforded no natural immunity, scarlet fever has been of a virulent type amongst Chinese. It is probable that the passage of the disease through the susceptible Chinese has led to an intensification of the virus, so that it is more fatal to foreigners also. There were thirty-two cases among foreigners, and a case mortality of 21·8 per cent. The prevalence of tuberculosis remains at the same high level, and the heavy death-rate (669 deaths in all) from this disease is significant of local conditions of overcrowding, against which at present there is no legislation. Quite a number of cases of malarial fever, mostly of the benign tertian type, are contracted in and around Shanghai. Beriberi has diminished, sixteen cases as against seventy-eight last year, and this improvement is held to be attributable to the measure of disinfection of body vermin among the prisoners in gaol.

Rabies.—Ten persons were bitten by dogs, and underwent the Pasteur treatment. The virus of rabies in Shanghai is of an exceptionally intense character, the period of incubation being shorter than the rabies met with in dogs in Europe. Cattle plague infected the dairies during the year. Immunization by Koch's gall method was offered to all the Chinese dairies, but almost invariably refused.

The Public Health Laboratory appears to be a busy institution; 20,599 specimens were examined during the year for pathological diagnosis, including 19,599 rats, of which 249 were found to be plague infected. Over 17,000 glycerinated calf vaccine tubes were sent out during the year.

A. Stanley, M.D., B.S.Lond., D.P.H.

Tengyueh.

The reports from this treaty port in South-west Yunnan do not differ materially from those of the previous year. The health of foreigners has been good. There were numerous deaths in and round the town due to dysentery, measles, typhoid and malarial fevers. Several cases of leprosy came under treatment. Malignant malaria appears to be very prevalent, especially among travellers from Burmah. An outbreak of small-pox occurred in February and March in the surrounding villages. Vaccination is gaining popularity, but the majority of the people are still in favour of inoculation. H. A. Ram Lall Sircar, the Consular Medical Officer, gives the following description of the practice of inoculation:—

"The scabs from small-pox cases are collected and stored in the form of powder for the season. This powder is blown up the nostrils of the children and causes an attack of artificial small-pox, the virulency or mildness of which depends on the doses used and the type of small-pox from which the scab was taken. When the attack is severe the result is pitiable, the unfortunate victims sometimes lose one or both eyes, some become permanently deaf, and some die of septicæmia. Two such cases came under my treatment lately. One of them had necrosis of the nasal bones due to multiple septic abscesses, and the other had lost one eye and had a big gangrenous ulcer on the right cheek. As they did not return I presume they both died."

H. A. Ram Lall Sincar; H. A. Wihal Chand.

Tien-tsin.

(Population over 1,000,000: The commercial capital of North China.)

The general health conditions of this important post remain very good for foreigners and Chinese alike. There have not been any epidemics. Among foreigners a few cases of typhoid fever occurred, and a peculiar feature of each autumn for the past three years has been the occurrence of sporadic cases of cerebro-spinal meningitis, mainly British and French soldiers. No satisfactory account has as yet been forthcoming as to the etiology of these cases, as all those affected lived in healthy sanitary surroundings. Venereal disease is frequent both among foreigners and Chinese, and there are also many native deaths from tuberculosis. The presence of several thousand soldiers of different nationalities in Tien-tsin, without any adequate enforcement of preventive measures against contagious diseases, is a matter which requires more supervision than it has hitherto received. In this great wool and hide importing centre, where carding and sorting is carried on in a large scale in local factories to prepare the trade for export, it is remarkable that human anthrax is almost non-existent, though particular attention has been paid in the past few years to its possible presence in view of the heavy indictment against China as the country of origin from whence the majority of infective skins, &c., which cause anthrax in England and the continent come. No bovine anthrax has yet been seen in North China.

Tsinan.

Abstracted from reports by Drs. Med. Kautzsch and Herrmann.

(Population, 100,000: The capital of Western Shantung.)

The general state of health in this consular district was on the whole unfavourable. The greater mortality of January, February, and March was occasioned, on the one hand, by numerous serious

cases of small-pox, scarlet fever, diphtheria and typhus and on the other hand by the pneumonic plague imported into Shantung last January. During summer there were heavier and more frequent rains than usual. An accumulation of illness was especially noticeable in August.

Diphtheria appeared specially in February amongst the Chinese population in a very virulent septicæmic form, which frequently caused death in two or three days without getting so far as any distinct membranous formation. Dr. Med. Kautzsch says that many cases reported as plague were really diphtheria. Typhus was very common in connection with the famine in South-west Shantung. It is probable that the first cases were imported from Tsingtau, where there was an epidemic of typhus fever, during which the well-known Dr. Med. Wunsch died, having been infected whilst treating a Chinese who recovered. The German doctors noted that Europeans less frequently survive typhus than the Chinese. Pneumonic plague was imported into Shantung in the beginning of January by the labourers returning every winter from Manchuria either by land via Techow or by sea via Chefoo. Dr. Kautzsch adds that "the importation of plague via Techow was doubtless due to the inauguration of labourers' trains on the stretch from Tien-tsin to Tsinan whereby some 60,000 coolies were carried. Had the railway not been completed at that time there would have been no plague in West Shantung."

Cases of typhoid fever have been more frequent during the past year, and Dr. E. Hermann reports that the Chinese recover more quickly from this disease than Europeans do.

Wuhu.

Abstracted from reports by Drs. E. H. Hart and H. S. Houghton.

(Population, 130,000: On the bank of the Yang-tsze River. It is the principal river port of Anhui Province and one of the chief rice exporting centres of the Empire.)

The health of foreigners in this port has been excellent, there were no deaths during the year. Skin affections, malaria, acute bronchitis, and genito-urinary complaints in the order named were the chief diseases in the foreign community. Drs. Hart and Houghton, in the report forwarded, have made some interesting remarks on the diseases found in Chinese in Wuhu and the surrounding district. It appears that typhoid fever is by no means uncommon among them, though its virulence is low. Small-pox is very abundant, but is probably decreasing in actual numbers of cases and in severity of infection, inasmuch as vaccination with calf lymph is eagerly sought and practised freely throughout the prefecture in recent years. Cholera is endemic. Under favourable conditions it becomes epidemic in the city and immediate suburbs, but the farming districts are spared. Dysentery is one of the commonest affections in Wuhu. The acute bacillary dysenteries are very abundant, reaching a climax in numbers in September. Somewhat less frequent is amœbic dysentery. The dysenteries associated with metazoal intestinal parasites, such as *Schistosomum japonicum* and *Strongyloides intestinalis*, while not seen in foreigners, in certain parts of this district and province constitute a serious menace to the farming classes.

Constant exposure to infection and reinfection being made necessary by work in the rice-paddies, there are some magistracies in Anhui wherein practically every other one of the farmers is infected. As heavily infected cases usually die in from one to four or five years, it will easily be seen how grave a problem it is in some of these places.

Malaria is plentiful, the commonest form being quartan, next benign tertian, the rarest subtertian. No cases of pernicious subtertian have been noted in Wuhu for some years past.

Kala-azar has an abundant distribution towards the north of the Province, but local cases have not been seen. There is, however, a constant stream of traffic between Wuhu and the infected area in the north, and imported cases have been found as far south as Kiangsi, so that the disease will in all probability reach Wuhu ere long.

Tuberculosis is increasing in the fertile soil of insanitary and unhygienic city life, and is the worst scourge of the city dwellers. All forms—pulmonary, cutaneous, bone and joint, and laryngeal—are very common.

Rabies is well known. Scarlet fever, plague, and diphtheria have not been seen in Wuhu. Relapsing fever has hitherto been absent, but has been recently introduced from the famine districts in the north.

Schistosomiasis.

In the first series of these reports some observations made by Dr. E. H. Hume on this disease were included, in which he quoted the case of a boy as being the first European on record to suffer from infection by the parasite *Schistosomum japonicum*. This year Dr. Hume is still more impressed, from a wider experience, of the danger which foreigners run, and the possibility of a wider distribution, and he added in the report his conviction that "bathing by foreigners in the waters of the Siang River should be forbidden until such time as we have fuller knowledge of the distribution and life-history of this treacherous parasite." Discovered so recently as 1904, first in Japan, by Katsurada, and a few months later by Catto, in Fukien, it has become increasingly evident throughout the Yang-tsze Valley. In some places whole villages seem infected, and in other places, *e.g.*, at Pingwu, in Chekiang, it is said to be "a perfect scourge." One is led to think in this connection of trypanosomiasis (sleeping sickness), which is also a scourge of recent years. I have passed through populated and contented agricultural districts in Central Africa, ten years ago, which are at present devastated and abandoned owing to wholesale infection by the trypanosome parasite. It therefore becomes

important to give every publicity to the work done to elucidate the growing problem of schistosome infection in China. In this year's report from Hankow, Dr. J. A. Thomson gives notes of three European cases which are symptomatic of the initial infection by *Schistosomum japonicum*.

Case No. 1.—Mr. Ms., an office clerk, arrived in China, October, 1910. On July 13, 1911, he complained of fever, headache, and general body pains. There was looseness of the bowels. Four days before he had been on a bathing picnic and had swallowed water while bathing. He had then noticed a peculiar pimply eruption on one toe, "so peculiar that he showed it to his companions," but it had all disappeared by next morning.

Physical examination: Abdomen and chest normal; tongue furred along the dorsum with a thick slimy coat, edges red but indented; blood examined for malaria was negative, no notable alteration. By July 29 the symptoms had become more acute, and on August 3 giant urticaria appeared on the abdomen, back, and thighs. On August 5 an eosinophilia of 36 per cent. was found, and next day examination of a small piece of mucus adhering to a constipated stool showed ova of *Schistosomum japonicum*. At this time the sigmoid became tender, rolling under the palpating fingers like a sausage; the spleen became palpable, and there was considerable enlargement of the liver. There was dull pain on inspiration; this was accompanied by a rising temperature, reaching its climax of 105·4° F. on August 7. All these symptoms were quickly relieved by calomel, after which the temperature steadily fell, and convalescence progressed slowly but surely. At the time Dr. Thomson wrote his report (September 24), ova were still present in the stool, also the sausage-like and tender thickening of the sigmoid remained *in statu quo*, but liver and spleen were normal in size; eosinophilia 34 per cent. The patient lost much in weight, but latterly regained this, and is now only 10 lb. under his normal. The treatment was purely symptomatic.

Case No. 2.—Mr. H. also came on July 13 for treatment with symptoms similar to those in Case No. 1. Eosinophilia 23 per cent. was found, no ova; but on August 29 they were discovered in mucus adhering to a constipated stool. Eosinophilia at this time reached 54 per cent. He also became convalescent under treatment.

Case No. 3.—Mr. Mc., under the care of Dr. Aird, Hankow. This patient came under observation on July 10, 1911. He, too, was an office clerk, who had arrived in China during the present year. He had similar symptoms, but had no rose spots or other eruption. It was not until August 7 that numerous characteristic ova of schistosomum were found. Liq. arsenicalis was prescribed, and he is now convalescent.

These three men, Ms., H., and Mc., all had a history of bathing in a lake some twelve to fifteen miles distant from Hankow.

Ms. is not a swimmer, and consequently his bathing consisted of standing splashing and dipping in the shallows. Mc. swims a little, but spent most of his time in the water with his companion Ms. H. is a better swimmer, but after swimming from the boat to the shore he sat on the bank dangling his legs in the shallow water for some minutes. Altogether there were twelve men in the party; these three and three others swam to the shore or paddled in the shallows, and of these latter three, two had fever with very pronounced eosinophilia; the third had eosinophilia without fever or other symptoms of illness. Taking into consideration the previous history of these last three and the presence of pronounced eosinophilia (30 to 40 per cent.) with no other discoverable cause, it might be justifiable to suspect them of being "blind" cases of the disease, that is, cases with infection, but with no discharge of ova, a condition which is easily conceivable when one remembers the habitat of the adult worm. The six other bathers, so far as Dr. Thomson could find out, are unaffected; they swam in deep water round the boat, and did not go ashore.

In cases of severe infection ova are readily discovered; but in the lesser infections ova are by no means plentiful, and can be very easily missed, even after centrifugalizing. It is pointed out that a much more certain way of finding ova is to get the patient constipated, and on the surface of the constipated stool small points of mucus, often blood-stained, will be found, and such mucus pressed under a cover glass will, as a rule, show several ova. It is probably an occupational infection, as practically all the cases reported have been amongst fishermen, rice farmers, boatmen, and raftmen; lakeside dwellers are peculiarly liable to the disease. This would further suggest infection by skin or anal contact with infected water. No cases have ever been reported amongst women. In this part of China women are all "small-footed," and care of their feet and feet-bindings is one of their first concerns, and their reason for not wading or working in paddy fields is obvious. The disease is present among pointers and other sporting dogs, and manifests itself in them by dysentery and wasting.

Dr. Thomson proceeds:—

"Native patients present themselves at hospital with a variety of symptoms.

"(1) Ova are found in the routine examination of stools of patients presenting themselves for some other disease.

"(2) Patients with remittent fever, large spleens, and enlarged livers, with dyspeptic troubles with or without diarrhœa or dysentery, but with a history of one or other of these.

"(3) Like 2, but with moderate ascites.

"(4) With shrunken liver, spleen enlarged or not enlarged, enormous ascites and extreme wasting.

"In man ascites is a very frequent accompaniment of the disease, but not so in dogs; I have known of dogs which have suffered severely for years, but have never known of one to have developed ascites, but, on the contrary, the abdomen becomes more and more retracted; dogs, however, are as a rule destroyed when dysentery and diarrhœa become so severe that shooting becomes more merciful than further attempts at treatment.

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"MORPHOLOGICALLY the adult worm is developed to live in a free space, as its suckers can have no other function. If it is a parasite of the portal venous system only, how can this explain the escape of ova from the intestines and ova reaching the lymphatic glands in such large numbers? The ova themselves are passive, and can only travel by being carried in currents. Those deposited by worms lying in the large veins anywhere in the portal system will naturally be carried by the blood-stream until they reach the small termini of the portal vein ramifications in the liver, and, there settling, cause congestion of the organ and interlobular cirrhosis manifesting itself clinically in enlargement and tenderness of the liver; in course of time coarser cirrhosis sets in with shrinking of the liver and development of ascites. It is conceivable, too, that adult worms may be lodged in the small radicles of the portal vein in the intestinal wall—radicles just big enough to contain the male and female pair; in such a case the pair of worms would themselves occlude the channel and cause the ova to accumulate behind them until the venous wall liberating the ova into the tissue spaces, from which some are carried away in the lymph stream to lodge in the glands and others get pressed upwards between the mucus glands to finally escape into the lumen of the bowel. Escape of the ova into the bowel would therefore altogether depend upon adult worms inhabiting very small venous radicles, and is therefore not necessarily a feature of the disease. A marked eosinophilia with a history of bathing in possibly infected water, with no other reason to account for such an eosinophilia, even in the absence of ova, may under certain circumstances (as in the three cases mentioned in which ova could not be found even after many examinations) justify one in diagnosing schistosomum infection as so-called 'blind' cases of the disease.

"Pathologically the disease may be divided into two stages:—

"(1) Febrile stage of invasion characterized by pronounced febrile reaction and remarkable eosinophilia. Clinically this stage has to be differentiated from fevers such as typhoid, paratyphoid, and malaria.

"(2) Ovian embolic stage, during which ova are settling in the liver and intestinal glands, causing cirrhosis of these organs. Fever is not, as a rule, a marked feature of this stage; it is rarely the symptom that the patient will complain of; this stage stimulates chronic kala-azar, chronic malaria, dysentery, or chronic diarrhœa or alcoholic cirrhosis. The duration of the disease will depend upon the number of worms present and upon the question if they ever die off or not, and it will be a problem for physicians practising among Europeans in China to determine what the prospects will be for patients who have been infected by bathing or wading once or twice.

"The prognosis is as yet doubtful, for, as regards Europeans who come early under treatment and avoid further infection, there are not enough cases so far upon which to pronounce definitely, but in their case it is decidedly more hopeful than among native patients, who are exposed to infection over and over again.

"In the diagnosis of schistosomum infection (a recent case), extreme eosinophilia will be the physician's first clue: that is, if the blood is examined as a routine procedure in all fever cases, and in 'blind' cases it may be the only clue. Eosinophilia is very pronounced, and is obvious in the ordinary examination for malarial parasites even without a detailed differential leucocyte count.

"Mr. F. had fever, but no ova were found. Mr. S. had no fever or other signs of illness, but six years previously had suffered from an undiagnosed fever following bathing.

"The mode of entrance into the body is still an undecided point. Mouth infection is likely, otherwise there could not be the marked limitation to the male sex.

"Ova when put into saline quickly hatch out, and the pointed ciliated embryo swims about actively for a time, then comes to rest; cilia are lost and the embryo enlarges and assumes the sporocyst stage of the liver fluke, but no further development occurs. An intermediate host for the development of cercaria suggests itself in some fresh-water mollusc, and it is to be hoped that, with the number of practitioners now interested in the subject in China and Japan, a full life-history will soon be forthcoming."

Dr. Thomson was able to make a *post-mortem* examination of one case, but the results are not included in this report. Briefly, the liver was shrunken and cirrhotic, with numerous scattered ova and sections of what appeared to be portions of

EXAMPLES OF EOSINOPHILIA.

	Date	Poly-morphonuclears. Per cent.	Eosinophilia. Per cent.	Lymphocytes. Per cent.	Mast cells. Per cent.	Large mononuclears. Per cent.
Mr. Ms.	August 13	50	36	11	1	2
,,	,, 27	37	34	24	1	4
Mr. Mc.	,, 10	48	45	5	0	3
Mr. H.	,, 28	27	54	17	0	2
Mr. F.	,, 13	30	39	23	3	5
Mr. S.	September 10	47	39	25	1	4

the adult worm in the cirrhotic area. The peritoneal glands were all enlarged, and there were about thirty pints of chylous fluid. The pathological findings all pointed to the disease being an embolic process, ova constituting the emboli. In this case no evidence could be found of filariæ to account for the chylous nature of the fluid. Ascites is the normal ending to all these cases, so far as Dr. Thomson has yet noted.

Colonial Medical Reports.—No. 36.—British Honduras.

MEDICAL REPORT FOR THE YEAR 1909.

By J. H. HUGH HARRISON.

Colonial Surgeon.

THE work of the Hospital during the year has been very satisfactory. Number treated during the year, 629, 96 in excess of last year. The figures for the year are as follows: Remaining at beginning of 1909, 38; admitted during the year, 591; total, 629.

This was a good year for surgery, operations averaging four per week.

LUNATIC ASYLUM.

The health of the lunatics was good. The following is the statistical record for the year: Remaining on January 1, 1909, 55; admitted during 1909, 8; total, 63. Remaining on December 31, 1909, 60.

POORHOUSE.

Number of inmates remaining on January 1, 1909, 36; number admitted in 1909, 4; total, 40.

QUARANTINE.

A suspicious case of yellow fever occurred on board the s.s. "Ellis," from New Orleans, last July. The case was removed to the Isolation Hospital at Moho Cay. On recovery, he was sent back to the States. All passengers were kept under quarantine and the vessel properly fumigated with sulphur.

The United States have shown their appreciation and confidence in this Colony by not putting any medical officer here during the present quarantine season.

INTERNAL QUARANTINE.

Owing to the outbreak of small-pox at Stann Creek that place was quarantined against the rest of the Colony. All persons coming from the town of Stann Creek were kept under medical surveillance.

Vessels boarded, fumigated, crews and passengers inspected by Health Officer for the Port of Belize.

Vessels boarded: Steamships, 267; schooners, 167; yawls, 35; sloops, 160; doreys, 210; total, 870. Number of vessels fumigated, 211; number of crew and labourers inspected, 19,456; number of passengers inspected, 3,150.

THE GENERAL HEALTH OF THE COLONY.

Corosal.—The health of this place has been good during the past year. It is a matter of much congratulation that dysentery was not as rife during the past year as in previous years. No infectious disease was reported during the year.

Orange Walk.—The infant mortality was very high. Out of 131 deaths registered, 58 occurred in children under 5 years of age. No infectious disease was reported. Anti-malarial measures were taken by filling up sundry ponds and low-lying swamps, and bringing the Mosquito Ordinance into proper force.

Stann Creek.—An outbreak of small-pox occurred in the commencement of the year. Luckily the cases were isolated early and general vaccination resorted to with the happy result that the disease was soon stamped out. Eight cases occurred, and of these three died.

Toledo District.—Report for the year was good. In May of last year, Dr. Mackey proceeded to San Antonio owing to a rumour that an epidemic was raging amongst the Indians. Dr. Mackey's report is appended, the conclusions of which point to the prevalence of tuberculosis and the hook-worm, but the epidemic which caused such a loss of life amongst the young residents during the early part of the year was, in my mind, undoubtedly due to pneumonia.

Belize District.—Tuberculosis is still on the increase; twelve deaths were reported from this cause in the town with seven in the hospital.

Several cases of myasis (screw-worm) were admitted. They seem to be becoming commoner in the place; in fact, I have noticed the flies on many occasions in the hospital, in my own house, and in the asylum gardens. Cases have been reported to me by private practitioners in the town. It is possible for great damage to be done by the screw-worm.

In one particular case the whole of the nose together with the right eye was destroyed. It is a wonder to me that the man survived, as the destruction to the tissues, not only of the nose but the posterior nares, was very great. Specimens of the fly were sent to the British Museum. They are known as the

Sarcophaga chrysostoma instead of what was understood to be the *Chrysomyia macellaria.*

Another most interesting case due to splenic abscess occurred in a boy 11 years of age. The actual notes were lost in the fire, but as far as my memory serves me the patient was suffering for over nine months. When admitted he was anæmic and haggard, complaining of pain on the left side radiating to the umbilicus. The abdomen was tense and he had ascites as well. On palpation you could feel the spleen right from the back to the left side reaching nearly to the umbilicus; above this point it showed a slight bulging which felt soft and pulpy to the touch. The liver also was enlarged, but the separation between this organ and the spleen was distinctly felt. I tapped him and drew off the ascitic fluid; this brought into prominence the splenic tumour very vividly. After two or three days I opened the bulging at its most prominent point and drew off about 6 oz. of pus which resembled the discharge of hepatic abscess. However, in spite of the abscess being well drained the boy died in about a week. I held a *post-mortem* and found the spleen nodular, very much enlarged and cirrhosed. All the other organs were pale and anæmic, otherwise healthy.

Another case of enlarged liver was admitted during the year. It was a patient of 10 years. The liver could be distinctly felt about 4 in. below the costal margin having a nodular feel to the touch. The patient was anæmic and much jaundiced and there were some ascites. He died soon after admittance. *Post-mortem* examination showed the liver much enlarged and scattered throughout with what appeared to be multiple abscesses varying in size from a pea to that of a small orange. On opening these they seemed to contain a sort of creamy caseous matter. The organ was sent to Dr. Stevens. His kind report was destroyed, but I believe on examination it was found to be of a carcinomatous nature. This is interesting from the fact that the patient was only 10 years of age.

Assistant Colonial Surgeon Mackey's Report on Visit to San Antonio, May, 1909.

I reached San Antonio at 11 a.m., May 28, and remained there until 7 a.m., June 1. Whilst there I was fortunate in being able to secure the services of an intelligent interpreter who rendered me much assistance.

Situation of the Settlement.—San Antonio seems to be about twenty-five miles in a north-westerly direction from Punta Gorda. The surrounding country is hilly. The settlement is situated on two neighbouring hillocks with a very shallow stream running between them. More huts are built on the higher of the two hillocks which has an easterly aspect. Some of the houses are so near the stream that it would appear they must be flooded when the river is high. The floors of such houses appear damp even in the dry season.

Dwellings.—The people of San Antonio live in huts which are roofed with bay leaves, and many have only one room. This is used for living, sleeping, cooking and eating. The walls of many of the huts are of open stockading, others are plastered with mud; they have earth floors. Very few of the huts are spacious. The dwellers in the mud-water houses seem to disregard the need of light and ventilation. After sundown the windows and doors are closed.

Water Supply.—Water is taken from a shallow well and also from the river for drinking and other purposes. The well water appeared very muddy and there was a copious earthy deposit seen on standing. The river water seemed to contain much macerated vegetable matter.

Food Supply.—There are many Milpas in the neighbourhood and the people seemed to have plenty of maize, so much so that the people carry it to Punta Gorda and San Louis for sale. Eggs and chickens were cheap in San Antonio. There were many pigs, and these appeared in good condition, but they were not kept in styes but allowed to wander about.

Habits of the People.—The people are very dirty in their habits, and as they appeared to disregard the common rules of hygiene much avoidable exposure to infection takes place. They expectorate freely over the walls and floors of their houses and then wipe away the residual sputum from their mouths on to the sleeves of their tunics or on to their hands, afterwards drying their hand on their trousers. One finds fæces scattered within the limits of the settlement. This is not due to the dirty practices of the children only, but also of the adults, some of whom defacate after nightfall on the ground within the settlement. The pathways in the bush, those along the river especially, are used as latrines. One is struck by the uncleanly condition of the children and most of the men. Pigs and fowl are allowed to live in the dwelling-houses, and both are often fed there.

Population.—This appeared to be about 450.

House to-house Visiting.—I visited each of the 93 dwellings in San Antonio, and examined such sick people as were met with in that way.

The following is a list of cases seen and examined with a few remarks added:—

Middle-aged woman said to suffer from "fits." She said she had a sick son in Punta Gorda, but could give no account of his symptoms.

Man, about 45 years of age, with chronic bronchitis.

Child, about 8 years, with acute broncho-pneumonia.

Man, aged 56, has chronic phthisis pulmonalis. Has been ill for fourteen months. Said he lost his son one year ago through "cough and bad chest."

Child, aged 4. Malarial fever.

Woman, middle aged. Has early signs of phthisis pulmonalis.

Girl, aged 12. Acute rheumatic arthritis. Cases VI and VII live in a very small hut along with four other persons.

Girl, aged 7, has marked phthisis pulmonalis. Said to have been ill six months. House is spacious, has open stockading walls. Situated on the top of the hill. Other occupants appear healthy.

Mother and son sick. Mother has phthisis, duration of illness said to be three years. Son at Milpa, so could not be examined.

Woman. Senile debility. Son said to have "bad cough," but is now away.

Child, aged 5. Pyococcic dermatitis.

Woman, aged 25. Acute gastritis (alcoholic).
Child, aged 6. Impetigo contagios.
Old woman. Chronic bronchitis. Child, aged 8. Acute arthritis (left knee).
Old woman. Mossy foot (hyperkeratosis). Duration said to be twenty years.
Old woman. Emphysema.
Boy, aged 12. Uncinariasis.
Boy, aged 6. Advanced uncinariasis.
Man, aged 25. Incipient phthisis.
Boy, aged 10. Marked uncinariasis.
Two girls, aged 8 and 4 respectively, and boy, aged 9. Uncinariasis.
Boy, aged 18. (?) Early phthisis pulmonalis.
Old woman. Advanced case of mitral regurgitation.
Man, aged 35. Marked phthisis pulmonalis.
Woman, aged 25. Malarial fever. Strong and well nourished.
Woman, aged 25. Old spinal caries.
Boy, aged 16. Malarial cachexia.
Man, aged 22. Advanced phthisis pulmonalis. House has walls of open stockading and is near river. Had been cupped over left apex by San Antonio Indian.
Man, aged 56. Emphysema and double cataract.
Girl, aged 7. Tuberculosis, adenitis and phthisis.
Man, aged 40. Phthisis pulmonalis. Sick for one year.
Man, aged 18. Malarial cachexia.
Man, aged 35. Malarial cachexia.

Microscopical Examination of Stools.—The people seemed very unwilling to send their stools for examination, probably due to their habit of using the bush. Four were examined, and ova of hook-worm found in one.

Estimation of Prevalence of Malaria.—Forty-two apparently healthy children were examined and specimens of their blood taken. These children were under 9 years of age with one exception, a girl of 12. Two of this number were slightly anæmic. Six showed marked splenomegaly. The spleens of seventeen others were slightly enlarged. The malarial parasite was present in 19 per cent. of the specimens of blood examined, there was an increase in the mononuclear cells in 30·9 per cent. Two of the specimens were spoiled previous to examination.

I inquired of several of the residents if they could describe to me the signs and symptoms of the young people who died in the early part of the year. The several accounts coincided very closely. They said it was the strong and healthy who were attacked and succumbed. Their illness lasted from three to five days, and the symptoms appeared very similar. They were "fever, bad cough, shortness of breath, pain in the chest and hard breathing." It was noticed that these sick people became bluish before death.

Conclusions.—(1) The people as a whole, especially the children, presented a healthier, stronger and less anæmic appearance than many of the Indian settlements in the western district of the colony.

(2) Pulmonary tuberculosis seems more prevalent than one would expect in such a community. This is likely to spread more rapidly than it ought to do owing to the want of hygiene amongst the people.

(3) Uncinariasis is present, but to a much less extent than in the settlements in the western district, or the effects of the hook-worm may be less marked.

(4) The disease which caused such a great loss of life among the young residents during the early part of this year might have been acute infective (creeping) lobar pneumonia, but from the description given one cannot form a definite opinion upon the matter.

(5) The incidence of malaria is high.

Whilst in San Antonio I took the opportunity of mentioning to the Senior Alcalde, and many of the people who gathered around in the evening, some of the more important precautions that the people might easily adopt, firstly in preventing malaria, secondly in lessening the risks of the spreading of phthisis and uncinariasis. They seemed eager to know what could be done in the matter, and expressed their intentions to carry out the recommendations.

Colonial Medical Reports.—No. 37.—Fiji.

MEDICAL REPORT FOR THE YEAR 1911.

By G. W. A. LYNCH.

Chief Medical Officer.

THE estimated population of the Colony at the end of 1911 amounted to 142,761, and was made up as follows :—

		Totals at last decennial census (1911)
Europeans	3,734	3,707
Half-castes	2,430	2,401
Indians	43,302	40,286
Polynesians	2,991	2,758
Rotumans	1,965	2,176
Fijians	87,229	87,096
Chinese	305	305
Others	805	812
Total	142,761	139,531

The difference between the numbers at the decennial census for the year 1911, and the total in December, 1911, is mainly accounted for by the larger numbers of Indians ; the increase here being due, in the main, to the larger importation of indentured Indians during the year, and the comparatively small number repatriated at the end of their term—there were 3,768 of the former, and 647 of the latter.

The total number of births in 1911 was less again that in 1910. There was a decrease also in 1910 as compared with 1909. Total decrease, 304. It is difficult to account for the heavy drop among Indian births. The fall amongst the Rotumans is due to the severe and universal epidemic of measles that swept through the entire population of this island in the early part of 1911. The fall amongst Fijians is the same as is noted with regularity each year with a population either falling or stationary. The number of marriages shows a general increase.

The number of deaths shows a decrease all round and, on the whole, the comparison with 1910 is good. There is a total decrease of deaths of the whole population of 147. In 1910 the increase in deaths was seen in every class; in 1911 the increase in deaths is seen only in the misfortune of the Rotuma epidemic of measles, but for which the total would have been far more satisfactory.

The birth-rate for 1911 is 32·20 per mille against 37·12 per mille in 1910, and 38·19 per mille in 1909. The European rate was 24·10 per mille, against 26·16 per mille in 1910 ; the increase in European population having been entirely amongst the males, by new arrivals in the Colony. The Fijian rate was 37·80 per mille, against 38·61 per mille in 1910. The Indian rate was 29·35 per mille against 37·28 per mille in 1910.

The great decrease in Indian births and birth-rate is not easily understood. It may be that registration is not very perfectly carried out amongst them and that thereby some births are missed.

The death-rate for 1911 for all races in the Colony, including Rotuma, was 33·11 per mille, against 35·44 per mille in 1910; 29·31 per mille in 1909 ; and 31·38 per mille in 1908. If the Rotuman figures are omitted the rate comes down to 30·10 per mille. The European rate was 12·34 per mille, against 19·10 per mille in 1910. The Fijian rate was 37·69 per mille, against 41·24 per mille in 1910. The Indian rate was 18·24 per mille, against 25·91 per mille in 1910.

The European figures are striking for a tropical country. Account has to be taken of the fact that a great many Europeans retire from Fiji after a certain age; but even allowing for that fact, and the fact that some invalids go away and do not return, the rate must be considered a low one. Among Fijians the heavy death-rate is among children ; and these die in large numbers from preventible diseases because of the apathy of parents, adherence to native remedies, and neglect to take advantage of the various provincial hospitals provided for their exclusive use in nine or ten different parts of the Colony.

Seasonal Prevalence of Disease.—From January to March or April is the season when admissions for dysentery are expected to be high ; in the last quarter, and especially in the last month of the year, native chronic cases do not present themselves in nearly such large numbers, as they are all most desirous of getting to their homes at Christmas time.

DISEASES.

Dysentery.—There were a large number of cases of this disease treated in all the hospitals throughout the Colony. At the Colonial Hospital, 274 cases, with 15 deaths ; in 1910 there were 353 cases, with 12 deaths. In the provincial hospitals, 220 cases, with 20 deaths ; in 1910 there were 347 cases, with 54 deaths. In the plantation hospitals there were 1,019 cases, with 49 deaths, against, in 1910, 1,156 cases, with 84 deaths.

In addition to these figures, the returns from native medical practitioners show that they treated in 1911, 621 cases of dysentery, with 33 deaths. The returns from this source were incomplete in 1910. In looking at these figures for dysentery cases, it must be pointed out that natives, in the greater majority of cases, keep their dysentery patients at home if they can possibly avoid sending them to hospital, and therefore a great number of dysentery, as well as other cases, are never reported to the native medical practitioners or district medical officers, or, if they are reported, only when the cases are *in extremis* and all native remedies have been exhausted. This is the common and disappointing experience of

every medical officer who has ever worked amongst Fijians.

With regard to the death-rate from dysentery quoted for the provincial (native) hospitals, it must also be noted that the friends and relatives frequently insist on removing their sick from hospital if they consider that the case is hopeless. The rate can therefore only be considered an approximate one amongst natives; just as the number of cases treated is but a small part possibly of those who suffer from the disease. It appears, however, from the tables given that the total number of cases is smaller than in 1910. The total number of deaths is very considerably less; the percentage of admissions for dysentery throughout the Colony is less; and the percentage of deaths from dysentery to cases admitted is also less; from which it may be said that while there were fewer deaths, the type of cases was milder, and perhaps more attention was given by natives to European methods of treatment. Printed circulars, containing simple recommendations for treatment of dysentery, have again been issued in English, Fijian, and Hindustani, and widely circulated in every part of the group. Some good may have resulted from these.

Enteric Fever.—At the Colonial Hospital there were 17 admissions for enteric fever with 3 deaths. In 1910 there were 6 admissions with 1 death. At the provincial hospitals there were 15 admissions, with 3 deaths, in 1911, against 34 cases and 3 deaths in 1910; at the plantation hospitals there were 11 cases and 4 deaths in 1911, against 2 cases and 1 death in 1910; a total of 43 cases and 10 deaths in 1911 against 42 cases and 5 deaths in 1910. Most of these cases occurred at the Colonial Hospital, at Rewa, Labasa, and Nadroga. Several of the cases atthe Colonial Hospital were also brought for treatment from the Rewa district, where, for several years past, there have been more or less serious outbreaks; thus, in 1910, 33 cases occurred in this district out of a total of 42 cases treated in the hospitals of the Colony. There seems, however, to be no doubt that this disease has spread and is spreading in the Colony; but now that, under the new Public Health Ordinance, there are increased facilities by law for notification there should be better means for controlling the disease by early notification and early isolation, especially of native cases.

Tuberculosis.—There would appear to be an upward tendency in this disease; and this is especially the case amongst natives, who fail to realize its gravity and therefore fail to take advantage of advice given to them with a view to its check and prevention. The low percentage in the plantation hospital patients is due, of course, to the fact that in these hospitals are treated entirely the indentured labourers in their first five years; and therefore they are the pick of the Indians, who should be free from such diseases, for all doubtful cases are weeded out at the depôt before indenture. At the Colonial Hospital, on the other hand, are admitted all conditions, and none are refused. The Indian patients in the Colonial Hospital may therefore be said to be all those who have broken down in the Colony. There is a steady rise in the cases admitted to the provincial hospitals, due, perhaps, to the fact that the numbers of patients show a certain steady rise in number for all diseases.

Measles.—A few cases of measles were treated in the Colony itself. There were cases introduced by the Indian immigrants in one or two districts. In the province of Kadavu, however, the disease was mildly epidemic—the epidemic is referred to in the report appended by the district medical officer, Kadavu. In Rotuma, however, measles was introduced early in the year with most disastrous results. The epidemic was a very severe one and swept through the entire population with an enormous mortality, the details of which are fully given in the report by the district medical officer, Rotuma. The results of the disease are still showing themselves amongst the people in the increased mortality from tuberculosis, ascribed by the medical officer to the results of the epidemic.

Influenza.—The incidence of this disease is not great, 10 cases being the total at the Colonial Hospital, 332 in the plantation hospitals, 154 in the provincial hospitals, against 34, 988, and 117 respectively for 1910. In Rotuma, however, there continue to be yearly outbreaks of this disease, and one of these, following the measles epidemic in 1911, added very markedly to the sick-rate, and by its sequel on to the death-rate of that island.

Dengue Fever.—Eighty-four cases were admitted to the Colonial Hospital during the year, of which 18 were Europeans—there were no deaths—957 to the plantation hospitals, and 290 to the provincial hospitals. For the same disease in 1910, the admissions were 41, 183, 236. Typical dengue fever is endemic in the Colony. It must be stated, as a general rule, that few new-comers escape, that the disease attacks them with considerable severity in most cases, and that these attacks are in the majority of instances quite typical. I do not think that there can be much doubt that many of the cases put down as "febricula" in hospital returns are, in reality, mild attacks of dengue fever, for this fever in Fiji, at any rate, may vary from extreme mildness to great severity, and even in the extremely mild cases there may be all the typical signs of dengue fever, though in a mild degree.

Tinea Imbricata.—A vast number of cases of this parasitic disease continue to be treated in many parts of the Colony, both at provincial hospitals and by native medical practitioners at their stations. The use of the sulphur fumigation method has been much extended until, at the present time, practically all provincial hospitals are provided with the fumigating apparatus, and many native medical practitioners also have the use of them. The results reported are good, and it is hoped that persistent care will now, in a short time, get rid of the disease altogether. A difficulty always arises, especially in the remoter districts, viz., the difficulty of effectual disinfection of the dwellings of the affected people, for these being made of native material—grass, reeds, &c.—are good holding ground for the parasite. Mats and old clothing can be and are destroyed, but the destruction of the house is a more difficult matter.

Frambœsia.—This disease may be considered to be slowly and gradually becoming less. The hospital

Return of Diseases and Deaths in 1911 in the Colonial Hospital, Fiji.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	6	—	6
Anæmia	—	—	—
Anthrax	—	—	—
Beriberi	3	—	3
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	2	—	2
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	84	—	84
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	266	15	274
Enteric Fever	17	3	17
Erysipelas	—	—	—
Febricula	106	—	109
Filariasis	—	—	—
Gonorrhœa	34	1	35
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	10	—	10
Kala-Azar	—	—	—
Leprosy	9	—	11
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	3	—	3
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	36	—	36
Mumps	17	—	17
New Growths—	—	—	—
Non-malignant	3	—	4
Malignant	7	1	7
Old Age	—	—	—
Other Diseases	28	4	28
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	16	—	16
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	1	—	1
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	6	—	6
(*b*) Secondary	16	—	17
(*c*) Tertiary	27	—	27
(*d*) Congenital	—	—	—
Tetanus	2	2	3
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c* Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	1	—	1
Other Tubercular Diseases	103	19	116
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	116	1	121
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	89	—	89
Circulatory System	25	5	27
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	—	—	—
(*a*) Diarrhœa	45	—	45
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	2	—	2
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	1	1	2
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	4	1	4
(*g*) Cirrhosis of Liver	1	1	1
(*h*) Acute Yellow Atrophy	1	1	1
(*i*) Sprue	—	—	—
(*j*) Other Diseases	90	—	90
Ear	21	—	21
Eye	47	—	47
Generative System—	—	—	—
Male Organs	31	1	31
Female Organs	90	2	94
Lymphatic System	26	1	28
Mental Diseases	—	—	—
Nervous System	36	7	37
Nose	—	—	—
Organs of Locomotion	19	1	19
Respiratory System	124	10	128
Skin—	—	—	—
(*a*) Scabies	27	—	27
(*b*) Ringworm	4	—	4
(*c*) Tinea Imbricata	1	—	1
(*d*) Favus	—	—	—
(*e*) Eczema	2	—	2
(*f*) Other Diseases	52	—	52
Urinary System	20	4	20
Injuries, General, Local—	118	2	121
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	1	—	1
(*c*) Other Injuries	—	—	—
Parasites—	47	—	49
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	106	5	109
Filaria medinensis (Guinea-worm)	3	—	3
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	1	—	1
Vegetable Alkaloids	1	—	1
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

returns, of course, show large numbers of admissions, but these are, in most cases, the late manifestations of the disease. The cases of primary frambœsia treated in hospitals are few, as admitted to the various hospitals; there are, of course, many cases still in the villages in all the provinces among the children. Much benefit has been shown by treating late cases of frambœsia with salvarsan at the Colonial Hospital. I saw all the cases, and there is no doubt possible as to the benefit of the treatment. Notable cases are those of persistent chronic ulceration, lasting for a period of many years, which showed considerable results after one injection, and left the hospital cured in three weeks, and have remained well since. The use of the drug is now being extended to the provincial hospitals, from which further statistics will no doubt be available for 1912.

Filariasis and Filarial Disease.—The results of filarial infection continue to be seen in all its manifestations in most parts of the Colony. This must remain so, so long as the country is as it is, and so long as there are vast areas which cannot be made mosquito-free, except at enormous cost. In this connection, it may be pointed out that in Suva a certain amount of work is being done to improve the drainage condition of the town by canalization and improving the existing watercourses; and it has been directed that a fixed sum be applied for in 1913, which is to be used for making this canalization of a more permanent nature. There is no doubt that the areas treated have been very much improved, but a great deal remains to be done, and to be done every year, before any real progress can be made in ridding the town of mosquitoes, and with that of mosquito-borne diseases. The present staff for this canalization work consists of a gang of ten prisoners with a native warder working, under a European overseer, in the municipal area of Suva. This small gang works under the direction of the Medical Officer of Health and Sanitary Inspector. It is an easy matter to see how large the work to be accomplished is, and how, with so small a staff, it must be a very gradual work, even within the small area of the town of Suva. When the vast swamps of the whole colony are looked at with a view to mosquito extermination and consequent ridding the colony of filariasis and other mosquito-borne diseases, it must be confessed that without enormous and continual outlay nothing could possibly be done which would have any practical effect. All efforts are now being directed towards the increased and better sanitation of native towns and their surroundings, and all medical officers and native medical practitioners have, as shown by their reports attached, directed their efforts towards this end by improvements in latrines, town and house cleanliness, use of clean mosquito-screens, and the clearance of bush and scrub for some distance round each town.

Ankylostomiasis manifests itself in a very great number of cases of Indians, many of whom bring it to the colony with them on introduction. A campaign has been started in a large plantation where the health from this cause has shown badly. On this plantation the medical officer has instituted regular week-end treatment for patients suffering from this disease with, so far, very excellent results. The patients for two, three, or four weeks go to hospital on each Saturday afternoon, and are treated at once with thymol, returning to work early on Monday in every case when well enough. The improvement in the patients on this plantation has been most marked. Of course, in any case where there appears to be the least need for so doing, the patient is retained in the hospital for a term. It is now proposed to carry out the same methods with regard to the patients in the Suva gaol, and on other plantations where the disease is prevalent, and by this individual inspection and improved sanitary inspection and conditions to eradicate, or, at any rate, materially reduce the disease.

Leprosy.—At the end of the year all the lepers were transferred from the old station at Beqa to the new one, and were comfortably installed there.

A brief account of the station may be of interest. Makogai is an island in the central part of the Fiji group, some eighteen miles north-east of Levuka, and about seventy miles from Suva. The area is 2,075 acres; length two and seven-eighth miles, breadth two miles. It is nearly circular in shape, and consists of high land in the centre up to 800 ft., with a series of flats all round the coast. It is on these flats that the settlements for the patients are placed, the plantations for food supplies are made, and the cattle paddocks are built. The island was purchased by the Government some three years ago. It was formerly a coco-nut plantation and cattle station. During the three years, and after many delays, the station has been at last completed. At the south end of the island (Nasau) are the quarters and station of the Medical Superintendent, European warder, and European mechanic, dwellings for various native officers and plantation labourers, some paddocks for cattle, plantations for food supplies, the butchery, and a cottage hospital and dispensary for the labourers. This part of the island is about two miles distant from the main leper station and is completely separated from the rest of the island by a high wire fence. The water supply of this part of the island is from a spring in the flat and is delivered by pipes to all the dwellings on the flat, and forced up to the quarters of the Medical Superintendent by an engine pump. The supply has, so far, proved amply sufficient. Latrines (except in the case of the Medical Superintendent, who is provided with a septic tank system) are pans, which are removed and emptied daily. From this part of the station to Dalici, the main leper station, is a fair, rideable tract, which passes through flats on the coast, where are plantations for food; and on a flat called "Aro" is the first settlement of houses for lepers. These consist of two kinds of dwellings—a series of verandahed wooden cottages for four or five inmates, and a set of dwellings in one building. Each set of buildings is provided with kitchen, bathroom, and latrine, and water is laid on to each, brought from the main water supply from the hills at the back of the main station at Dalici. A hill separates this settlement from the main settlement at Dalici. This is a large bay with good anchorage, in which is a considerable area of flat land running thence up the coast to the north end of the island.

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THERE are many buildings here—hospitals for males and females; quarters for female European lepers; quarters for the two native medical practitioners and servants; storerooms; a lock-up; and, at a short distance inland, quarters for the two European nursing sisters and their two female native assistants. On the land running hence to the extreme north end of the island are cottages similar to those at "Aro" for patients. Water is brought from a stream about 150 ft. above Dalici by pipes, and distributed to the whole station and up to the north end. The supply has so far been sufficient and it is estimated that it will be ample when the station is fully occupied. Latrines are small movable ones placed over pits. All patients who can do so, are expected to plant their own food to some extent, and are allotted some land for this purpose. The Fijian and Melanesian patients have begun well in this respect—the Indian not so well. At the extreme north end of the island is a large flat, which has been converted by the Medical Superintendent into a series of paddocks for cattle and sheep—these are doing well and will materially assist in making the station self-supporting. Pigs and goats are also kept and bred on the island for food for patients. The plantations consist of areas planted in yams, tapioca, sweet potatoes, rice, bananas (the unfortunate hurricane early in 1912 completely ruined these). The planting is systematically carried out; with green manure crops to improve the soil and frequent and regular ploughing, the crops obtained will, in time, it is confidently expected by the Medical Superintendent, supply all the needs of the station. The energy of the Medical Superintendent in this respect has been most exemplary; and he has had many set-backs in the way of the hurricane above mentioned, destruction of growing crops by rats, mice, and insects, and very great difficulties in the way of preparation of the land due to the difficulty of obtaining sufficient labour for the purpose. The station is provided with an auxiliary cutter, which crosses to Levuka, weekly, for stores, mails, &c. During 1912 it is expected that the majority of the lepers in Fiji will be taken to the island. In the matter of certifying and collecting from so scattered a colony, the question of their transport must involve certain delay.

The increase in the work of the Government pharmacy multiplies yearly with the increasing number of stations to which supplies must be sent. I regret that there is no report by the pharmacist this year on his work as analyst, for he has been absent from the Colony from ill-health since July. The analytical work which has much increased, has been carried on entirely by the medical officer of health.

The bacteriological laboratory is now in full working order, but the time of the bacteriologist, who is also medical officer of health, is mainly taken up with his work as medical officer of health, which latter increases very rapidly.

Admissions to the Colonial Hospital, Suva, increased from 1,973 in 1910 to 2,120 in 1911. There were 195 European admissions in 1911, against 202 in 1910. There were 95 deaths in 1911, against 107 in 1910. The detailed return of cases is appended to this report. No new buildings were added to the hospital during the year, but it was approved that quarters should be erected early in 1912 for the new appointment of junior medical officer at the hospital under the new arrangement to be detailed below. It has not been possible yet to take steps towards the rebuilding of the hospital and concentration of the various blocks, but the need especially for a new European block and new nurses' quarters is being more urgently felt as years go on.

Nursing Staff, Colonial Hospital.—The matron proceeded on long leave, the appointment of acting matron being filled by Miss V. Griffiths, a former pupil at the Hospital, who returned to the Colony to take the appointment. The nursing staff was filled to its full strength during the year by the appointment of three probationers, who filled the place of one nurse resigned and two other long standing vacancies. Seven new native obstetric nurses were qualified and sent out to new districts. The demand for these native obstetric nurses increases, and though they may not be so much used and appreciated by the natives amongst whom they work as might be wished, there can be no doubt that their work is good and that they are more called for as time goes on.

The number of native medical practitioners in 1911 was 37, employed as follows: 1 as dispenser, Colonial Hospital; 1 as dispenser, Levuka Hospital; 2 as native medical practitioners, Makogai Leper Station; 8 as native medical practitioners, provincial hospitals; 25 as native medical practitioners in twenty-five districts. Five students qualified in 1911. Three new districts were made and 2 filled vacancies. The class of native medical students is reduced to 15. By many of the native medical practitioners it may be said that excellent work is being done; and special attention is being given by them to sanitary work in native villages with, it is hoped, beneficial results. Their struggle is an uphill one, and they require much encouragement and supervision to prevent their lapsing into laziness and apathy. Two of the earliest qualified native medical practitioners retired on the grounds of age and ill-health.

Lau District.—In the Lau district one of the three proposed hospitals was begun, at Lomaolma, and will be complete and occupied in 1912.

The new Gaol Infirmary was begun in 1911, and will be finished and occupied in 1912, thus relieving the Colonial Hospital of the treatment of all male prison patients. The infirmary will accommodate all male sick prisoners. It consists of a block for patients, European and native wards, a dispensary, operating room, and quarters for native medical practitioners in residence. It will be under the charge of the visiting medical officer, who is also resident medical officer at the Colonial Hospital. The site is a good one, on the larger reclamation in front of the present gaol. The building is of brick, and is one of the first public buildings to be made of this material. In spite of the most constant and watchful care on the part of the medical officer and gaol authorities, there was again, in the early part of the year, a very

considerable outbreak of dysentery in the institution. Inspections for sanitary improvement are frequent and thorough; all suggestions for improvements are carried out with little delay. The kitchens are practically fly-proof, and are separated by a considerable distance from the latrines, which lie on the lee side of the kitchen. Latrines are of the pan system, daily emptied, and supplied with plentiful lime for covering evacuations, while they are kept dark and well covered to prevent the access of flies; all drains are flushed out daily and much disinfectant is frequently used. Notwithstanding these precautions, and the care with which it is certain that they are carried out under close European supervision, there is the same yearly recurrence of dysentery, beginning usually towards the end of December or beginning of January and increasing up to the close of the hottest months, when there is a gradual decline to practically nothing in the last months of the year. The outbreak in 1911 was, however, neither so severe nor so prolonged as that of 1910; the number of cases were fewer and the type of the disease was milder. Ninety-eight Indian prisoners, 18 Fijian prisoners, 3 others, and 1 gaol warder (a total of 120 cases) were attacked. It is remarkable to note the disproportion between Indian prisoners and Fijian prisoners, and the single case of a gaol warder, while no other member of the staff, either native or European, was attacked, in spite of the fact that there is a very considerable staff—Fijian, Indian, and European—resident in the gaol precincts, with their families. All medical officers who have been visiting medical officers to the gaol have been forced to recognize the fact that the Indians do, undoubtedly, malinger in some indescribable manner, so as to produce such irritation of the bowels as to make them easy victims to the disease. (We have the well-known case of an Indian prisoner found eating finely powdered glass in large quantities, and there are others.) And, although it must not be thought that any attempt is made to shelve this highly important matter by such a solution as malingering to begin with in every case, yet the conclusion is forced upon one that, in the dysentery season, it must be responsible for some of the Indian cases, who thereupon spread it to others. In support of these conclusions it must be stated that Fijians themselves suffer severely from dysentery in all parts of Fiji, while in the gaol, as compared with Indians, they cannot be said to so suffer, as proved by the figures shown above of the number of cases. When the gaol infirmary is open and in use, and prisoners can no longer escape discipline by means of a period of residence in the Colonial Hospital, and when the new gaol with its single cells in place of the present large general sleeping apartment is in use, some amelioration may be hoped for. In other respects, the gaol produced no more than its average number of sick.

A new medical district was opened (as noted above) in the island of Vanualevu. It has been called the Cakaudrove district, including, as it does, the whole of that part of the province of Cakaudrove which is situated on the island named above. It is a large district, with small plantations, owned by Europeans, and each employing a few indentured Indians. The station of the medical officer has been fixed near to that of the stipendary magistrate at Valeci, in Savusavu Bay, and sufficient land has been provided for the future establishment of a provincial hospital, which is really much needed in this part of the Colony. The district was opened by Dr. Smartt in the latter half of the year. This medical officer caused a small native building to be erected, and with the small material at his disposal has treated a very considerable number of cases both of natives and of indentured labourers.

There are now sixteen medical districts, including Rotuma and Makogai, and of these, four medical officers combine in their districts the duty of medical officer and stipendiary magistrate, viz., in the districts of Taviuni, Lau, Bua, and Rotuma.

Vaccinations for the Year.

During the year, 3,104 vaccinations were performed. The number is smaller than in 1910.

The number of unsuccessful vaccinations is large and is accounted for, as usual, by delay in getting supplies of lymph to distant out-stations, and constant deterioration.

The lymph used is wholly glycerinated calf lymph, which is imported twice monthly from New Zealand.

The number of medical officers in out-districts who vaccinate is 15, and the number of native medical practitioners who are provincial vaccinators is 36, of whom 10 are attached to provincial hospitals and 2 are native medical practitioners, who, though they have retired, still do some work in the districts in which they live. The remainder (24) are native medical practitioners who are stationed in outlying districts and work under the direction of the nearest European medical officer, to whom they make periodical reports of all work done.

G. W. A. Lynch.

Public Lunatic Asylum, Suva.

During the year 1911, there were treated at the Public Lunatic Asylum, 39 patients; 24 remained over from December 31, 1910; 15 were admitted during the year; 5 were discharged cured; and 5 died; 29 remained on December 31, 1911. The patients were 29 males and 10 females. There were 8 Europeans, 12 Fijians, 16 Indians, and 3 others. The Europeans were 5 males and 3 females. One of the chronic European cases died suddenly. One female European admitted during the year was a readmission of a patient who had been in the asylum several times before, and is a sister of the other chronic European female case. There were 5 deaths.

Since the removal of the native male patients to their more spacious new quarters, there is a very considerable improvement in their general health, and the services of the resident European female attendant have had a good effect on the female patients, especially the Europeans. These being very chronic cases, it is not to be expected that they will be cured, but under the care of the attendant there is constant supervision, and an increased appearance

of well-being. The type of cases admitted is on the whole a chronic type in nearly all cases.

G. W. A. Lynch.

Port of Suva.

The health of the port during the year has been good, and no case of quarantinable disease has occurred.

Two outbreaks of cholera occurred in Honolulu during the year. In the first outbreak, between February 23 and March 14, 31 cases with 26 deaths occurred. In the second, between April 12 and 25, 8 cases with 7 deaths occurred. During these periods the passengers and crews of vessels arriving from this port were inspected, but no cases of cholera occurred on board.

In April and May, plague was prevalent in Auckland, but the epidemic was by no means severe, and was promptly stamped out. Plague-infected rats were, however, found in that city during the last days of May. Inspection of passengers and crews of all ships coming from this port was carried out, and mooring restrictions for the prevention of landing of infected rats were put in force.

In the beginning of February, an effort was made to reduce the number of rats infecting the wharf and buildings in the neighbourhood. Traps were supplied, and the sum of 2d. was offered for each rat caught. This plan was not, however, a success as the natives were too apathetic to set traps. In September, therefore, a rat-catcher (an Indian) was appointed at a fixed wage of 30s. per month and 1d. for each rat. He, working with twelve traps, accounted for 188 rats and 125 mice.

The new Quarantine Ordinance, No. XXII of 1911, came into force on October 18.

Town of Suva.

The health of the town during the year has been good.

Prevalence of Disease.—Measles was present in mild epidemic form during the year, 121 cases having occurred in the town between the beginning of February and the end of the year. In the last quarter a few cases of rötheln occurred.

Typhoid Fever.—A few sporadic cases occurred in the district, but this disease was not present in epidemic form. In all cases, routine measures of disinfection of houses, bedding, clothes, &c., and the removal of all cases to hospital were carried out, and thus the spread of the disease prevented.

Dysentery appears to have been less prevalent than usual, and the same may be said for dengue fever.

In February, leaflets on "The Prevention of Dysentery," in English, Fijian, and Hindustani, were widely distributed throughout the Colony, and by familiarizing the people with the cause of the disease and its dissemination by flies and other ways, together with the enforcement of regulations regarding the use of dry material in latrines, we feel some result has already been achieved in the diminished incidence of the disease. The sanitary inspector (Mr. Chalmers) has been most assiduous in enforcing the regulations with regard to the satisfactory sanitation of latrines and yards. The work of clearing and canalizing the watercourses in and about the town, which naturally entails the drainage of swampy land in the ravines, by the sanitary gang, progresses steadily. Much difficulty is experienced in some of these watercourses. The aim is to dig out smooth, shallow, V-shaped channels on the soapstone surface, so that at no time can there be accumulations of water in which breeding-places for mosquitoes could be formed. The irregularity of surface of the soapstone, however, renders it necessary in many places in the course of a channel, to build up the bed of the channel in the pockets of earth where the soapstone surface sinks, with stone, to form a uniform gradient; again, the sudden rush of water down the steep slopes in the heavy showers frequent here, washes away the earth banks above the soapstone, so that it is necessary in many places to face the banks with stone.

A. E. Ireland, D.P.H.

Lautoka.

The year was a hot one. The wet season was wetter than the average. The dry season was unusually dry, with only 9·21 in. of rain in five months (August to December). There was little or no cold weather, and the heat of December was certainly well above the average, the highest maximum shade temperature recorded (100° F.) being registered this month. The mean temperature for January was 79·5° F., the mean for July, 75·3° F., a difference of less than five degrees.

In spite of the climatic conditions the health of the indentured Indian immigrants, free Indians, Fijians, and Europeans was satisfactory during the year. No fewer than 1,700 cases (Indians) passed through the plantation hospital, and 55 of them died. The deaths were mostly infants, from enteritis (27 out of the 55). Seven died from dysentery out of 106 cases. The only medical event of the year was an epidemic of dengue fever, or seven-day fever, which continued during the months of February, March, and April, coinciding with the mosquito season. During these three months, 241 Indians, or nearly one-fifth of the indentured population, passed through the hospital. Very many Europeans also suffered, but the number of cases was not recorded.

It is customary in Fiji to call the fever noted above "dengue fever," but I believe the fever corresponds rather with that known as "seven-day fever" in India. It has become indigenous in Fiji, and in all the centres of population occurs sporadically all the year round. In this district there was hardly a day this year in which I did not visit at least one patient suffering from this pyrexia. At certain intervals the pyrexia appears in epidemic form, as this year.

The type of fever now observed is sporadic; it lasts as a rule from five to seven days without the non-febrile period. There is rarely a rash, and then only a fugitive erythema. The headache and eyeball-ache are usually more severe than the backache and limb-ache, and sequelæ are absent.

The sanitary state of the district is satisfactory, though the water supply of some of the villages might be improved. There has been nothing special to note, nothing outside the ordinary routine; no official

action was taken during the year, but many insanitary conditions were rectified on attention being drawn to them by the Local Authority.

During the year, 156 persons were vaccinated. Almost all the children over a year old are now vaccinated—Indians, Fijians, Europeans, &c.

H. N. JOYNT.

REWA.

The population, as roughly estimated, is: Europeans, 300; indentured Indians, 1,900; free Indians, 6,000; Fijians, 10,000; miscellaneous, 200.

Following on the very unhealthy year of 1910, the health of the district was, in the early part of the year, bad, but improved considerably in the latter half, as the disorganization caused by the 1910 hurricane was remedied. Dysentery was very prevalent. To the plantation hospitals there were 285 admissions for this disease—over one-seventh of the whole indentured population—and the mortality was 5·9 per cent. of the cases, as against 6·2 per cent. in 1910, and 3·3 per cent. in 1909. The average stay in hospital of those who died was over 100 days, showing that the cases were of a chronic nature. Only 38 cases (nearly all amongst children) were admitted to the provincial hospital.

Only 9 cases of enteric fever were seen in the district. Two of these were connected with each other; the rest were separate cases, and show that points of infection are scattered throughout the district. There was less dengue than in recent years, apart from an epidemic in June, July, and August amongst recently arrived indentured Indians.

Ankylostomiasis continues almost universal amongst the Indian population. There were 279 admissions for it to the plantation hospital.

All the coolie lines in the district were visited at least three times during the year. The sanitary conditions were generally satisfactory.

Plantation Hospitals.—Nausori Hospital was kept in good repair, and sanitation and the staff of attendants were sufficient.

Baulevu Hospital.—With this has now been amalgamated Naitasiri Hospital. The buildings are good, but the equipment is poor, and serious cases often have to be taken to Nausori Hospital. The small hospital at Koronivia supplied the needs of about 150 indentured labourers sufficiently.

Native Villages.—Few of these have yet been fully rebuilt since the hurricane of 1910, and many of the people are still living in small temporary houses. The water supply of the villages is generally good, but arrangements for the disposal of sewerage are very poor.

In the free Indian settlements the water supply is invariably from surface wells. In places where the subsoil water is only a few inches from the surface, the water is extremely bad. Under these circumstances also, pit closets cannot be provided, and excrement is deposited over the surface of the land.

In March, 1911, the Sub-Inspector of Police was appointed Sanitary Inspector of the district, and a beginning was made in improving sanitation. Efforts were chiefly expended in providing for each house a closet from which flies could be excluded, and so situated that wells should not be polluted. Considerable improvements were obtained in the immediate vicinity of Nausori.

Meteorologically, the year was a normal one. The rainfall was 108 inches. None of the diseases prevalent bear any obvious relation to the dry or wet months of the year. A. MONTAGUE.

MAKOGAI.

The asylum was opened on November 29, with 20 lepers transferred from Beqa. Another 20 followed on December 7, from the same source. No other lepers were admitted during the year. A few minor operations were performed, chiefly removal of necrosed bone, scrapings, general cleaning up. All patients were, unless there were contra-indications, put on chaulmoogra oil, and their sores dressed, They have greatly improved in general condition.

When in Sydney, on leave, I attended the leper lazarette. Drs. Ashburton Thompson and Millard gave me every assistance and placed records of cases and treatment at my disposal. No treatment, in their opinion, had been discovered as curative.

Sanitation.—Much has been done to endeavour to decrease the number of flies and mosquitoes at the station. The burial of excreta and rubbish in this sandy soil is, I think, most unsatisfactory. I have seen the larvæ of the common fly crawling on the surface after the fæces infected with its ova had been buried to the depth of three feet. Burial of excreta with substances that would inhibit or destroy the growth of the larvæ is expensive and unsatisfactory when undertaken by natives.

The water supplies at Dalici and Nasau were very low at the end of December. The slip and wharf were finished after the asylum was opened.

The general health of all residents has been excellent. F. HALL.

LABASA.

The population of this district as shown at the census taken in April, 1911, was as follows:—

	Males	Females	Total
Europeans ..	129	65	194
Half-castes ..	66	57	123
Indians	4,278	2,470	6,748
Polynesians ..	60	1	61
Others	24	7	31
Total ..	4,557	2,600	7,157

Diseases.

Enteric Fever.—Twelve cases came under observation and treatment, of which 4 proved fatal. The first case occurred in February, in the person of a free Indian woman living on an isolated "zamin" at the Bulileka free coolie settlement. She was removed to hospital and recovered. About the middle of April, four other free Indians were found to be suffering from enteric in the Bulileka settlement, and were removed to hospital. It subsequently transpired that the woman mentioned in the first case had, on her discharge from hospital, moved to a "zamin" adjoining those on which these other coolies developed. I have no doubt that she was still a "carrier," and that the disease was conveyed to the others by flies.

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In April, also, 2 indentured Indians and 1 European developed enteric fever. Of the former, one lived in labour lines and may have contracted this disease during a visit to the patients in hospital. The other was a woman engaged as hospital nurse and whose duties included the nursing of some of the enteric cases. She was carefully instructed and warned as to the precautions to be taken and the risk of their neglect, but obviously without avail, as she became infected and unfortunately died of the disease. I could not trace the source of the infection in the case of the European (a young male adult); he also died. A male half-caste child, living at Malau, also had the disease about the same time. He was treated in Macuata provincial hospital, and recovered. Two other cases occurred among the indentured Indians in June, and three in September. Of the latter, one proved fatal. The source of their infection could not be traced, and there was no apparent connection with the previous cases. The earlier cases all had relapses.

Measles broke out in the district in April, the infection being brought by the s.s. *Motusa*. It did not spread widely, there being only seven cases (all half-castes) in the immediate neighbourhood of Labasa. A few Fijian cases occurred in outside districts, and in July there was one isolated case in an indentured immigrant, from the Naleba estate, newly arrived in the district.

Varicella.—There was a small outbreak of this disease among newly arrived coolies in June. Twenty-one cases occurred in all, and 12 broke out at the same time on widely separated estates, 8 cases occurring subsequently in July and 1 in August. Consideration of dates and circumstances pointed to the steamer *Providence A*, which brought the coolies from Nukulau, as the source of infection.

Dengue fever occurred in epidemic form, commencing in August and reaching its height in October. Two hundred and seventy cases were treated among the indentured Indian immigrants, and it was widespread among other classes of the community. It still continued at the end of the year, though rapidly declining.

Dysentery.—One hundred and eight-two cases of this disease were treated in the Indian plantation hospital, with 2 deaths; 39 at the Macuata provincial hospital, with 3 deaths; and 31 in the gaol. A few cases occurred during the year among Europeans and a few were treated. The number of cases was least in April, May, and June, the figures for the other months being mostly uniform.

Tuberculosis was moderately prevalent; 5 cases with 2 deaths were treated in the Indian hospitals, and 6 cases with no deaths at the Fijian Hospital.

Yaws was, of course, general. Twelve early and 142 later cases were treated at the Macuata provincial hospital.

Syphilis.—Forty cases of the primary disease, 19 secondary, 8 tertiary, and 5 inherited were treated at the plantation hospitals, and a number of cases of syphilis were also seen by me privately among free Indians and Europeans. Treatment by mercurial injections was systematically carried out among the indentured Indian patients.

Other Venereal Diseases.—One hundred and fifty-nine cases of gonorrhœa were treated at the plantation hospitals. Cases of chancroid were fairly numerous in the district.

Eye Diseases.—Three hundred and thirty-three cases, chiefly conjunctivitis and secondary keratitis, were treated among the indentured Indians, and 14 at the Fijian Hospital. Pterygium is common.

Respiratory Diseases.—There were 161 cases at the plantation hospitals—mostly colds and bronchitis—and 14 at the Fijian Hospital. Asthma was common, as in previous years, among Indians in the district.

Diseases of Digestive System.—Under this heading there were 26 cases among indentured Indians and 14 among the Fijians treated in hospital. Dysentery is not included. Diarrhœa showed a seasonal prevalence similar to that of dysentery, and 15 cases proved fatal, chiefly among children.

Parasites.—Ankylostomiasis was very common among the newly indentured coolies who arrived in 1911, especially those from the second s.s. *Sutlej*. Some of the cases were very severe and 7 proved fatal. I saw no cases among Fijians.

Scabies.—There were 213 cases among indentured Indians and 11 among Fijians.

Tinea imbricata is enormously prevalent among the Macuata Fijians, but very few of these cases come to the hospital.

Filariasis was also, as usual, extremely common among the Fijians of the province. Thirty cases were treated at the provincial hospital.

Injuries.—Among the indentured Indians there were 3 fatal cases of injury—one suicidal hanging; one internal lesions, due to crushing between trucks on the railway-line; and one of head injuries, the result of assault.

The crushing season at the mill was happily unattended in 1911 by any serious injury. Twenty-five cases of injuries, including a large number of fish-bites, were treated in Fijians at Vuo Hospital.

Plantation hospitals, three in number, in the Labasa district. There were 2,983 in-patients, with 46 deaths. Except in very occasional cases, I do not have indentured Indians treated as out-patients, as the system is, in my opinion, unsatisfactory.

Plantation Lines and Sanitation. — The lines throughout the district have been kept under frequent supervision, and on the whole were well kept. The Colonial Sugar Refining Company had allowed many of the buildings both at the plantation hospitals and the various lines to fall into disrepair, and during the year numerous orders were made for betterment. These, which have been carried out, included the repainting of all three plantation hospitals, repairs to the buildings of the same, the provision of a mortuary at Wainikoro Hospital, and of improved isolation accommodation both there and at the Labasa Hospital; the closing of the well and opening of a new one at Tuatua estate; new latrines for several estates; and the furnishing of all latrines with back-flaps and doors at the entrances, to exclude flies; the whitewashing and repairing of floors in line

nurseries; and the provision of fly-proof cupboards; attention to line drainage, &c.

Macuata Provincial Hospital.—The number of in-patients treated was 364, with 6 deaths; and the number of out-patients was 822. The new arrangement as to native food supply has proved most unsatisfactory. As I anticipated, no voluntary contributions of native food-stuffs for sale have been made, and throughout the year the patients, to their great discontent, have had to subsist on rice, except for a short time when yams were purchased from a European on the Dreketi River. The old system of regular district contributions of food month by month was infinitely more satisfactory from the hospital point of view. Under the present system, admission to the hospital means practically a complete stoppage of normal diet, with anything but good results.

Native town sanitation has been attended to in accessible towns by the district medical officer, and in outlying districts by the native medical practitioner. The Macuta towns are fairly clean on the whole, though the people themselves are most backward and dirty.

Free Coolie Settlements.—Efforts have been made by the district medical officer and sanitary inspector to supervise and improve the sanitary condition of these. The question of suitable latrines remains a very difficult problem. A system of pan-closets is impracticable without regular organization, backed by law, and cesspits are open to grave objection owing to the fact that the large majority of the "zamins" have a well water supply. The position remains very unsatisfactory.

General Sanitary Work.—Much was done in 1911. At the time of the outbreak of enteric fever, previously mentioned, I made myself a house-to-house inspection in the central district, and numerous orders were made, latrines were all put in order, garbage receptacles provided, and drainage attended to. The Colonial Sugar Refining Company's main water supply was the subject of unfavourable report by me to Suva, and my opinions were confirmed by the analysis of the Medical Officer of Health. I ordered the whole of the surface drains of the Colonial Sugar Refining Company's lower Labasa lines to be concreted, owing to the fact that in view of the central position of these lines and the observed tendency of the drains in question to become fouled and to breed flies and mosquitoes they constituted, in my opinion, a menace to the health of the community. The work is now nearly completed. Concrete drains have also been substituted for the earthen drains through the grounds of Labasa plantation hospital, which is also in the midst of the European and general settlement of Labasa. A shipment of frozen mutton, brought to Labasa, was condemned by me as unfit for food, and destroyed. I found the cold storage arrangements both at the local butchery and on the *Fiona* satisfactory, and in my opinion the meat was bad when shipped in Sydney. But even if good when shipped, the necessary exposure and heat in transport up this river at Labasa renders it a dangerous article of import, in my opinion, and I advised the Colonial Sugar Refining Company not to repeat it.

Meteorological Conditions.—The rainfall for 1911 was 108·90 inches. Both wet and dry seasons were unusually prolonged in 1911, the latter commencing late, but continuing to and beyond the end of the year. Labasa is probably the hottest big station in Fiji, and it has amply maintained this reputation during 1911. E. G. E. Arnold.

Rotuma.

The estimated population of the island at the mid-year was 1,973 persons, and the actual number ascertained by a census taken on November 27, was 1,983.

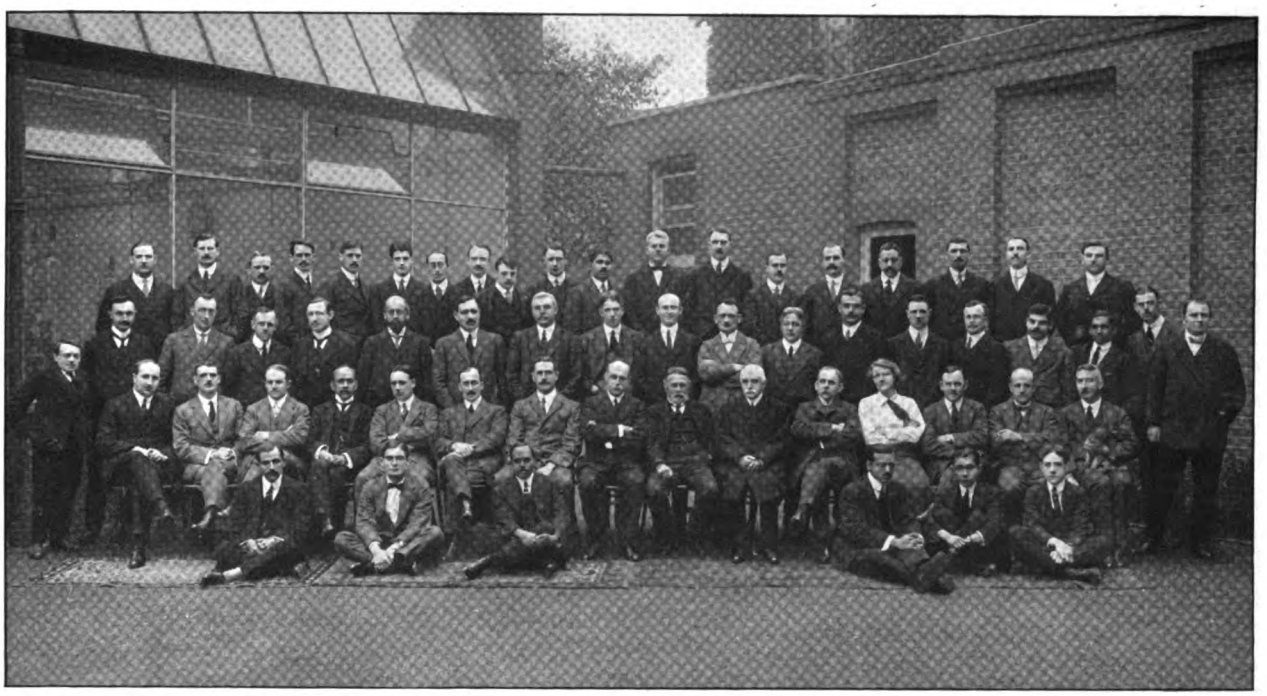
The births numbered 79, and the birth-rate, calculated on the number of the people on November 27, only reached 39·8 per mille. This is a low rate for this place where rates of 50, 52, 56, and even 59 per mille have been recorded. Of the total number, one was a still-birth and five premature, and the cause of these was infection with measles on the part of the mothers. About 18 per cent. of the children born had the blood of the other races in them. Illegitimates numbered 7, or about 8 per cent. of the total. The male births were seventeen in excess of the female, and numbered 48, the female only 31.

The deaths numbered 489, and the death-rate reached the enormous figure of 246·5 per mille. The death-rate has always been high here, and in former years the lowest rate I have registered has been 37 per mille and the highest 54. A death-rate of 73 per mille was recorded in the year 1901, when Dr. Hall visited this place in connection with an epidemic of choleraic diarrhœa, which had prevailed for some time before his arrival. When one compares these rates with a normal one of 17 per 1,000 the contrast is great. The explanation of the high rate this year is, of course, the epidemic of measles which, allowed to run through the people for the first time, during my absence on leave, swept them off literally in hundreds. The female deaths were sixty-five in excess of the male, and numbered 277, as against 212. I have shown a return of the age period at which death occurred, and from it it will be noticed that death has been most busy among young children and adults from 20 to 45 years of age. From 5 to 20 years the incidence has not been so heavy, and over 45 years it has been comparatively slight. Among the causes of death measles leads the way with its 326 victims. The disease, as I have already reported, was in most cases complicated with ileo-colitis, most likely of bacillary origin; in some with tubercular disease of the lungs; in a few with yaws, pneumonia, pregnancy, child-birth, miscarriage. Phthisis pulmonalis follows next with 26 deaths. Since the measles epidemic its prevalence has been widespread. Acute broncho-pneumonia carried off twenty children—in most cases the disease might be put down as an after result of measles. I have put down twenty-three cases to acute ileo-colitis, following measles in all cases, but where complete recovery from the latter disease had taken place.

The marriages numbered thirty-one, giving a marriage-rate of 15·6 per mille—somewhat higher than usual, but brought about by couples marrying either of which had lost a wife or a husband in the epidemic.

LONDON SCHOOL OF TROPICAL MEDICINE.

45th Session. May—July, 1914.



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Sitting on Ground.—S. Elias, J. Baeza, C. Sivasithamparam, J. V. Shirgaokar, M. C. Thavara, D. Stocker (*Lab. Asst.*).

Absent.—Miss M. I. Balfour, J. A. Beattie, J. H. Fenn, A. G. Eldred, M. F. Reaney (Capt. I.M.S.), D. Duff.

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(UNIVERSITY OF LONDON),

Under the Auspices of His Majesty's Government,

CONNAUGHT ROAD, ALBERT DOCKS, E.

In connection with the Albert Dock Hospital of the SEAMEN'S HOSPITAL SOCIETY.

THE SEAMEN'S HOSPITAL SOCIETY was established in the year 1821 and incorporated in 1833, and from time to time has been enlarged and extended. It now consists of the Dreadnought Hospital, Greenwich, to which is attached the London School of Clinical Medicine; the Royal Victoria and Albert Docks Hospital; the East and West India Docks Dispensary; and the Gravesend Dispensary.

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LECTURES AND DEMONSTRATIONS DAILY BY MEMBERS OF THE STAFF.

There are three Sessions yearly of three months each, October 1st, January 15th, and May 1st. A Course in Tropical Sanitation and Hygiene is held in the October and May Sessions. Women Graduates are received as Students.

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Students of the London School of Tropical Medicine, who join the London School of Clinical Medicine, will be allowed an abatement on their fees and *vice versâ*.

Chief Office—Seamen's Hospital, Greenwich, S.E.

Measles were introduced on January 29, when I was absent, and on my return, on March 26, 700 cases were reported to me as existing. The epidemic continued throughout April and May, and finally died out in June. It caused 50 deaths in March; 198 in April; 74 in May; and 4 in June. It was accompanied by or followed with acute ileo-colitis—a very fatal complication in most cases. Influenza appeared about the close of April and continued its course through May. It was unfortunate that it should have followed so close on the heels of the last-mentioned epidemic, as it must have undoubtedly been fatal to many measles convalescents. Mumps were also prevalent in May, and the swellings in many cases disappeared very slowly; it was not, however, very widespread.

The natives have the same objection here as in Fiji to stay as in-patients, much preferring the society of their own relations and the privacy of their own houses when sick. The out-patient department, on the other hand, is always taken free advantage of. A great many of course were seen in their homes. The total number for the year reaches 4,083; and the large numbers shown in March, April, and May are connected with the measles epidemic.

The rainfall for the year amounted to 147·04 inches. The highest fall was recorded in the month of February, when 26·92 inches fell; the lowest in the month of July; but the full force of the trades is felt here. The lowest temperature recorded by the thermometer has been one of 66° at night, and the highest 74°. Ninety-seven degrees is the highest temperature registered by the maximum thermometer, and 72° the lowest.

The general sanitary condition of the place is good. All concrete houses have been whitewashed (lime), inside and outside, at the close of the year and, as they constitute the majority of the houses, it may be said that most of them have had their walls at least disinfected. The concrete tanks, which provide the water for drinking and cooking purposes, have been washed out. They now provide a plentiful supply of potable water for the people. The villages are clean, in all cases situated near the beach and so open to the sea breezes, and a wall running more or less round the island between the villages and the interior land keeps the pigs from among the houses. Flies and mosquitoes, however, abound. The latter breed in swamps, of which a few are in existence here and which are made use of for taro cultivation; they also breed in coco-nuts which have been made use of for drinking purposes and then cast on the ground. All the plantations are littered with such and it is impossible, in my opinion, to abolish this source of mosquito production.

Owing to the epidemic already referred to in this report, only a few vaccinations could be done this year. The results of vaccinations done are not satisfactory, but this is due to the age of the lymph when it reaches here. Lymph, which arrives here from forty to sixty days after its date of origin in New Zealand, in most cases is active, but beyond this period it seems to become inert and yields no results.

H. MACDONALD.

BUA.

Vital Statistics.

	Population.	Births.	Deaths.
Europeans	38	—	—
Fijians	3,560	148	146
Indians	274	6	5
Miscellaneous	126	1	4

The diseases prevalent during 1911 were of a general character. The year was singularly free of epidemic disease and to this fact, chiefly, I attribute the absence of any decrease in the native population.

Dysentery caused only four deaths throughout the year. Four cases of enteric fever occurred in the Bua district. An unusually large number of cases of pneumonia were observed, due in most cases, I believe, to the fact that in many villages the Fijians would not take the trouble to make their houses weather-proof. Filarial diseases were as common as ever, and are likely to remain so until something is done to drain the many swamps to be found in close proximity to native villages.

SPECIAL REPORTS.

Plantation Hospitals.—The only one in this district is at Wainunu Tea Estate. From other plantations sick men are sent into the native hospital, and, as most of the labourers are Fijians, the plan works well. There were 285 admissions to the Wainunu plantation hospital during 1911, but the great majority of admissions were for very trivial ailments. Mild attacks of fever, muscular rheumatism, and small ulcers accounted for most of them. Four deaths took place; three amongst infants.

The plantation lines were kept in a satisfactory manner, but a good deal of trouble was experienced by the manager in getting men for latrine work, and as a result, I could not get all I wished done in the matter of sanitation.

Native Hospital.—There were 561 admissions to the native hospital, the majority of cases admitted being as usual yaws and tinea imbricata. Filarial diseases accounted for 28 of the admissions, and for one case of this disease treated in hospital, I should say twenty occurred in the district. Nineteen cases of croupous pneumonia were admitted as in-patients, most of them coming from villages not far away. Only five cases of dysentery were admitted during the year, and but few cases were reported from the districts. Many people suffering from the ravages of tertiary yaws received great benefit from their stay in hospital. The admissions for tertiary yaws number 116. Children suffering from the secondary stage of the disease numbered 50.

Native Town Sanitation.—I inspected a good number of native villages during the year, paying particular attention to sites, water supply, houses, and latrine arrangements. Where the Buli of the district and the village chiefs were active men with some power over their people, I generally found the villages in a satisfactory state, but one does not find that class of man all over the province by any means. Swamps exist about many villages. Talking about mosquito-borne diseases to a Buli or Turage-ni-koro will often bring forth the usual Fijian expression of surprise at the depth of one's knowledge, but in his heart he

believes it to be nonsense, and he will drain his swamp when he is made to, but certainly not before.

Latrine Arrangements.—Generally speaking they are good if the inspection is expected and exceedingly bad on surprise visits. But on the whole I believe things are improving in this respect. Only frequent inspections by native officials educated to the work will keep native villages in a sanitary state in a province where there is no sanitary inspector. The Roko, Bulis, native medical practitioners and provincial officers can all assist; but it is very important that their notions of sanitation should agree, and I believe I have brought this state of things to pass. The use of mosquito-screens has become more general, and the bad habit of spitting in houses is, I am glad to say, on the decrease.

Free Coolie Settlements.—Latrines have been insisted on in the same manner as in Fijian villages. Wells have been protected to some extent by making fences around them, and by the use of only one clean bucket for drawing water at each well.

J. Farrington.

Taviuni.

The total European population of the district is about 100. Statistics for Indians are incomplete. The population was about 260, with 10 births and 3 deaths. There are no free Indian settlements. The Fijian population was 1,300, and there were 69 births, and 48 deaths, and 19 marriages among them—giving a birth-rate of 53 and a death-rate of almost 37 per 1,000. The birth-rate is extraordinarily high, but is supplied from data in the Provincial Office.

Dysentery was prevalent during the early months of the year among all races.

Influenza was rife all the year through, but in a mild form only, and caused no deaths.

Tuberculosis is very widespread among the Fijians, but occurs little among the Indians.

Leprosy shows 16 cases, of whom one is a half-caste (son of a leprous Fijian mother), three are Polynesians, and the remainder Fijians.

Frambœsia is, of course, the hall-mark of the Fijian, and the number of cases from this disease more than doubles that from any other. No cases occurred among the Indians.

The sanitary condition of the native towns is fair. They are mostly kept well weeded and clean, and have good water supply. In many instances the seashore is used as a latrine, and in other cases there is a small erection put up over a running stream close to the town it serves.

There are no free coolie settlements. The general sanitary condition of the district is good. There is no sanitary inspector.

The year as a whole was somewhat a dry one. During the first two months large quantities of rain fell, amounting to more than half of the average fall of the previous three years; but the middle and later months of the year were very dry. The usual strong and somewhat constant south-easterly wind was conspicuous by its absence or mildness from May to October, the months in which it is usually most in evidence.

A. W. Campbell.

Kadavu.

The population of Kadavu amounted to 6,359 persons in October, 1911, being composed as follows:—Europeans, 26; half-castes, 50; Chinese, 18; Indians, 7; Polynesians, 2; Fijians, 6,256: total, 6,359. The above figures, with regard to the Fijian population, are approximate only, and were obtained as the result of a census of native towns made in October, 1911, for the Provincial Council.

Deliberate and wilful neglect to seek European medical aid caused the deaths of no less than 11 children from whooping-cough alone. The number of deaths during each quarter of the year were as follows: First quarter, 66; second quarter, 87; third quarter, 50; fourth quarter, 43. The first half of the year was thus much more unhealthy than the second. The chief causes of mortality during the first six months were acute dysentery, diarrhœa, and whooping-cough.

Dysentery and Epidemic Diarrhœa.—These were very intimately related, and there is reason to believe that many so-called deaths from the latter were returned incorrectly and were really due to dysentery. Together these two diseases accounted for 59 of the total 246 deaths—i.e., 24 per cent. of the mortality. Of these no less than 50 deaths occurred during the first six months of 1911. That flies play a most important part in the spread of the disease must be admitted by all. My local experience inclines me to look upon contamination of drinking-water as the most likely cause. In almost every town in the province, including the provincial hospital at Vunisea, the drinking-water, whether obtained from creeks or springs, is very liable to contamination by decaying vegetable matter of every kind, which gets washed into and falls into the creeks, primitive reservoirs, &c.

Owing to the habits of the natives, who allow their food, utensils, &c., to be fully exposed to contamination by infected flies, and who use the bush around their towns in place of closets, the problem of eradicating the disease is not an easy one.

Whooping-cough.—The disease seems to have been widely distributed, but I am unable to give the total number of cases. At the provincial hospital, Vunisea, 161 cases were treated as out-patients, with 2 deaths only. In the Naceva district, the natives refused to accept European treatment in most towns, and in consequence no fewer than 11 children died there. It is safe to say that the majority of the deaths were entirely due to gross negligence, ignorance, and obstinacy on the part of the parents of the children—all the deaths having occurred among children.

Secondary Yaws or Coko.—There is no doubt whatever that almost all such cases were due to gross negligence, ignorance, and obstinacy on the part of the parents, none of whom brought their children to hospital. I have never seen an uncomplicated case of coko die, and during my nine years' experience in Fiji I have personally had several hundreds of cases under my care at hospital.

Colonial Medical Reports.—No. 37.—Fiji—(*continued*).

Measles.—This was introduced by a half-caste child suffering from the disease, who was brought from Suva to Kadavu in March, 1911. There have been 186 cases altogether, with 4 deaths. Such disinfection as was possible was practised, but this was very limited, as it is impossible to disinfect the Fijian houses except by burning down the same. The type of the disease was mild in most cases, and the deaths which occurred were all due to secondary dysentery.

Tuberculosis.—There can be no doubt as to the increasing prevalence of tuberculosis, especially of the lungs and lymphatic glands, and to a less extent of abdominal tuberculosis. The filthy domestic habits of the natives tend to make the spread of the disease an easy one.

Influenza is epidemic in Kadavu. It was directly responsible for 15 deaths, or 6 per cent. of the total mortality. From time to time it breaks forth into extensive epidemics, disabling whole villages at a time.

Liver Abscess.—Only one case was seen by me during the year, and the patient, a Fijian adult, was sent to the Suva Hospital, where he was successfully operated on.

Trachoma.—This is very prevalent all over the group. The dirty habits of the natives and their indifference to flies combine to make the spread of the disease a very easy one.

Sanitary Work.—There are no Indian or Polynesian settlements here, and sanitary work is practically confined to the Fijians. The towns are badly kept, overgrown, and rubbish allowed to accumulate. On learning of the approach of the medical officer the attempt is often made to hastily clean up the same. The outskirts of the town were almost everywhere absolutely neglected and overgrown, and in some cases used as an "al fresco" closet. The question of house-building is a complicated one, and, owing to the communal system, one is powerless to deal with individuals.

Meteorological Conditions.—No record is kept here of the same. The first eight months of the year were unusually wet, and since then we have had very dry and hot weather, except for a week's rain in November.

R. F. DE BOISSIÈRE.

BA.

Tuberculosis.—This disease is accountable for the majority of deaths, comparatively, but at all events among the Fijians, who do not comprehend the seriousness of this malady. Should any cases admitted become seriously ill, the invariable and piteous appeal both by patient and relatives for cough medicine follow, and one has either to grant the request or run the risk of diminution of applicants for admission to hospital.

Yaws.—One finds this disease and its sequelæ predominating in the returns, but the figures do not represent anything like the actual number of cases that are bound to exist. That Bulis and Turaga-ni-koros fail to interest themselves sufficiently in forcing cases into hospitals is evinced by the fact that most of one's admissions are made after visitation of the native medical practitioner, and a general round up.

Venereals.—Within the last seven or eight years one used to find the wards of plantation hospitals filled with patients, but, nowadays, this disease is less frequently met with. This is due to systematic injection treatment and surveillance of all cases met with.

Plantation Hospitals.—There are two in the medical district of Ba. Both institutions are well found and managed, and the sanitary arrangements in good order.

Native Town Sanitation.—In a general way the sanitary conditions are reasonably satisfactory. Towards the latter end of the year there was a distinct improvement in matters hygienic.

Free Coolie Settlements.—Very little was attempted towards the betterment of this very necessary and extensive work. With greater power under the new Health Ordinance, and with the appointment of a sanitary inspector, one is in a better position to deal with the problem.

General Sanitary Conditions.—As in most rural districts where dwellings are self-contained and at some distance from one another, good sanitary conditions depend to a degree upon the personal habits of the individual. In a general way, the sanitary conditions prevailing are satisfactory.

JOHN HALLEY, M.D.

LEVUKA.

The European population in the province of Lomaiviti is approximately 400. The population of the town of Levuka is about 380 Europeans and 300 half-castes. The Fijian population of Lomaiviti is estimated at 5,200, as follows: Ovalau and Moturiki, 1,821; Gau, 1,421; Koro, 1,250; Nairai, 416; Batiki, 292. The Indians in this district all live within the town of Levuka, or within a short distance of the town boundaries; their number is 120. They have increased rapidly in the last few years, and included among them are a number of Tamils. The number of Solomon Islanders and natives of New Hebrides living in Levuka is estimated at 220. The number of natives of other Pacific Islands is about 100. The number of Chinamen, nine months ago, was 28, but I am of opinion that this number was considerably exceeded at the end of 1911. The statistics available are insufficient to enable me to give any birth-rate for the different classes of the inhabitants. The following are the only death-rates which I can obtain: Europeans, 13·16; half-castes, 13·33. These are good death-rates, but being based on such a small population they are of no real value.

Diseases Prevalent during the Year.

Dysentery.—Nineteen cases of dysentery were admitted to the Levuka Hospital during 1911, and 5 of these cases proved fatal.

Enteric Fever.—Only three cases of enteric fever were recorded during the year; one of these proved fatal.

Tuberculosis.—This disease is very prevalent among Fijians. It is, I believe, increasing. Pulmonary

tuberculosis is far more frequently met with than any other form of the disease.

Native Town Sanitation.

Water Supply.—Ovalau is an exceptionally well-watered island, and there is no town where the natives cannot get good water, and in most towns they have but a short distance to go for it. Moturiki is not at all well watered. The other islands in Lomaiviti are all fairly well supplied with water.

Latrines.—Most of the houses are on the coast, and the latrines are built over the sea. A good type of latrine for natives, but they are not always well built or kept in good repair.

General Sanitary Work and Sanitary Condition.—The surface drainage has been in some parts of the town of Levuka improved by the construction of concrete culverts. The removal of night-soil has been done on the whole fairly satisfactorily, but the present system can never be considered efficient. It is the most primitive form of the conservancy system, and is capable of great improvement, apart from the installation of a drainage system.

B. M. Wilson, M.D.

Lau.

The Lomaloma Hospital was only begun at the close of the year (the previous native reed and thatch building was in too bad a state to be repaired, and the commencement of the new building was delayed far beyond the estimated date), so that all patients seen were either out-patients at the dispensary or else visited at their own houses. This has made the work more heavy for the year 1911 than it would have otherwise been. The population of the whole district, taken at the April census, was as follows: Europeans, 76; half-castes, 54; Fijians and Tongans, 6,942; Polynesians, 209; Indians, 104; other races, 14; total, 7,399. The people of the islands of Vanuabalavu, Cicia, Tuvuea, Nayau, and Cikobia, and also the labourers from the privately owned islands, usually come to the Lomaloma Hospital for treatment—the more southerly islanders going to Lakeba or Matuku. Thus an estimated population of 2,410 is catered for by the Lomaloma Hospital. Out of this number of persons 2,029 cases were actually treated in 1911. The very large proportion of dengue fever cases—242 out of a total of 2,029 cases of all sorts—is noticeable. This I attribute largely to the presence of the mosquito breeding swamps on this island, particularly at Lomaloma, and this is borne out by the fact that in the dry months of May, June, and August (July in 1911 was a wet month), the outlets of this swamp dried and filled up, so that the water inside stagnated, the sea-tide could not get in, and mosquitoes were bred in millions.

Cases of Dysentery.—These, last year, have been remarkably few. This may be due to the extra precautions taken as regards enforcement of separate latrines in the villages.

Respiratory diseases have, as usual, been numerous. Twenty-nine cases of tuberculosis of the lungs occurred. This disease is increasing in the Lau Islands, the cases in the southern islands of the group would, I am sure, show still higher numbers if properly diagnosed by the native medical practitioners.

Diseases of the digestive system have been mostly of a trivial nature, due chiefly to the eating of improper foods and the drinking of impure water. Owing to the lack of running water, these tanks are often kept in a very dirty state, half choked with leaves and sediment.

The sanitary state of the towns is, on the whole, good. Latrines are still far from being universal. A compulsory clearing of all bush for a half mile radius from all towns would be of enormous benefit by doing away with the temptation to make use of the bush for latrine purposes, and would also keep down the mosquitoes or flies.

T. R. St. Johnston.

Nadi.

The estimated population of the district of Nadi at the end of 1911 amounted to 7,260, and was made up as follows: Europeans and other whites, 127; aboriginal Fijians, 3,300; East Indian immigrants, 3,800; half-castes and other degrees, 23; all others, 10.

Particulars, as far as available, of births and deaths which took place among the various races in the district are as follows: European births, 4 (31·5 per 1,000); European death, 1 (0·7 per 1,000); Fijian births in six of the eight districts (population 2,550), 104 (40 per 1,000); Fijian deaths in six of the eight districts (population 2,550), 102 (40 per 1,000).

There has been but little change in the prevalence of disease in the different seasons of the year. The general health has been excellent throughout and, with the exception of cases arising among indentured Indians, very little dysentery.

Eight cases of leprosy (6 among Fijians—0·13 per cent.—and 2 in Indians) were existent during the year. The Fijian cases were all living in isolated houses away from their towns. There has been no measles at all in this district during the recent epidemic elsewhere. Twelve cases of mumps developed amongst the newly arrived indentured Indians. They were strictly isolated in a separate building in the Nadi plantation hospital and the disease did not spread.

During the months of August and September about 30 cases of whooping-cough developed amongst Fijian children in six towns (Nadi and Sikituru districts). These children were all isolated under the care of a special attendant. The cases all recovered.

There were two hospitals for indentured Indians during the year in this district. One thousand eight hundred and twenty-seven Indians were treated at these two hospitals during the year, with 43 deaths. Three hundred and forty-eight surgical operations were performed.

All the plantation lines were visited at frequent intervals during the year, and on each occasion were found in a satisfactory condition.

The thirty-seven native towns were each of them inspected monthly with very few exceptions. The water supply, drainage, condition of houses, kitchens

and latrines, &c., are alike, in most cases, very satisfactory.

The sanitary condition generally of the district is very good. There is no sanitary inspector at present.

Two hundred and forty vaccinations were performed during the year, of which 221 were successful.

G. H. HUSTLER, M.B.

NAVUA.

Diseases Prevalent During the Year.—Amongst the European population the most prevalent disease has been dengue fever. Dysentery and diarrhœa have also occurred at times, chiefly when the supply of water was scarce, owing to drought. Diarrhœa in particular was very common during the dry spell of August and September. With regard to Indians, the principal diseases, as usual, have been dysentery and bowel complaints in general. There was a rather extensive outbreak of influenzal catarrh during the latter end of the year at Beqa which spread to other villages.

Tuberculosis does not appear to be prevalent to any extent amongst the natives of Namosi and Serua.

Yaws is common enough amongst the children, but during my inspections of the native villages I have not seen a single case of the extensive and destructive ulceration which is such a common sequela or manifestation of the disease in some parts of the country.

Seasonal Prevalence.—Dengue fever and influenza, dysentery and diarrhœa, were all most prevalent in the early months of the year—January, February, and March. The numbers fell very considerably in the succeeding months, but are now again on the upgrade. This appears to be almost invariable, year by year, the most unhealthy season corresponding with the hottest and wet part of the year. Periods of prolonged drought, however, have an adverse effect on the general health—no doubt from accumulation of offensive material and from the water in the tanks becoming stale and more or less unfit for drinking. Mortality was fairly evenly distributed throughout the year.

Plantation Hospitals.—There is only one plantation hospital in the district, viz., at Tamunua. This also serves the coolies indentured to estates farther down the coast, of which there are four or five. The total number of admissions to the hospital of immigrants indentured to the Vancouver-Fiji Sugar Company was 2,432, and the number of immigrants, including children, in December, was 1,229. The total number of deaths was 53.

Dysentery accounts for 9·5 per cent. of admissions. This disease has been very prevalent during the year; in the early part more especially at Lobau, and laterly at Tamunua. The most important of the parasitic diseases is ankylostomiasis, which is very prevalent on some estates. The number of deaths in hospital of indentured immigrants was 53, being 2·17 per cent. of the admissions. Deaths from dysentery amounted to 10 (or 4·29 per cent.), and from other diseases of the digestive system to 14, or 4·4 per cent. of the admissions for these diseases respectively.

Coolie Lines and their Sanitation.—The lines have been frequently inspected during the year, more particularly those yielding the greatest number of hospital cases, viz., Tamunua and Lobau. With regard to Tamunua lines, it was decided that certain improvements should be effected. The Lobau lines are badly situated on low-lying, swampy ground. No very great or permanent improvement can be expected until these lines are moved and re-erected in an elevated position.

Native Towns Sanitation.—The medical district of Navua includes Namosi and Serua provinces. Namosi: This province has been medically inspected three times this year (1911). The sanitary condition of most of the towns is very satisfactory, and the mountain villages especially have an excellent and abundant supply of pure running water. All villages are provided with latrines, but whether used much is rather doubtful. The towns are well drained, the grass kept short, and the general appearance at such times as I saw them was neat. Serua: The towns of this province have been inspected twice, and some three times. Their sanitary state is for the most part satisfactory.

Free Coolie Settlements.—These, of which there are a considerable number in the district, have been visited from time to time. Their sanitary arrangements are of the most primitive description. The water is obtained in a great many cases from shallow surface wells, sunk close to the hut, and liable to contamination from being unlined and uncovered. In other cases the river water is used—a filthy and contaminated supply. The infant mortality is appalling from ignorance and apathy of mothers.

Meteorological Conditions.—There is nothing of particular importance to record except the prolonged dry spell in August and September. The rainfall for the last quarter of the year was considerably below the average.

J. W. HUNT, M.B.

NADROGA.

Vital Statistics.—Total population at mid-year, 9,511, constituted thus: Europeans, 80; Fijians, 7,265; Indians, 1,940; half-castes, 56; Polynesians, 70; Chinese, 100.

Fijians	Population	Births	Deaths
Nadroga ..	3,183 ..	152 ..	162
Colo West ..	4,082 ..	143 ..	138

The hospital is easily accessible to all parts of Nadroga. In the district of Sigatoka, the towns of which are all within a quarter of a mile, there were 29 deaths; of these 8 were stated to have been attended, *i.e.*, 27 per cent.

Causes of Death.—Examination of the register has revealed a serious epidemic of whooping-cough and typhoid fever (if the diagnosis of the Fijians can be accepted) in Nadroga, and dysentery in Colo West, without any previous report to the district medical officer or native medical practitioner.

Sudden Deaths.—Two cases of sudden death, during the last two months, where the patient has not been ill more than one day, have come to my notice. I was able to perform autopsies and, in my opinion,

death was due to poisoning by Fijian medicines. Of the 162 deaths in Nadroga, there were "not ill more than one day," 18; of these one was ill for thirty minutes, and others for only one hour. No notice seems to have been taken of these deaths, and there appears to be no machinery to deal with such cases. These figures speak for themselves.

Prevalent Diseases.—Typhoid fever (severe form): January to March cases—Europeans, 5 (1 death); Indians, 6 (1 death); Fijians 2 (1 death). Fijian returns show an additional nine deaths. Cases were not reported, and the extent of the epidemic amongst Fijians is not known. Origin of the disease not traced.

Whooping-cough: January to March. In Nadroga the Fijian returns show a total of 31 deaths from whooping-cough—only 5 were reported and attended by the district medical officer or native medical practitioner.

Dengue: January to March. Amongst Europeans, 20 cases.

Fever—of unknown origin. Three to four days' duration was very prevalent amongst Europeans and Indians, and was most common in the sand-fly districts.

Plantation Hospitals.—The hospitals at Lomawai, Nadovi, and Kavanagasau were in use until May, after which only Lomawai was kept open. Total admissions, 1,540; deaths, 17; births, 33. Prevalent diseases: Febricula, 212; gonorrhœa, 115; eye diseases, 102; diarrhœa, &c., 115; diseases of the skin, 262; injuries, 240; operations, 80.

Plantation Lines.—Frequent inspections have been made during the year in all permanent estates. Water has been laid on by wells and pumps, and latrines have been concreted. At the end of the year sanitation was very good.

Native Hospitals.—Total admissions, 336; deaths, 5; operations, 37; out-patients, 969; daily average, 85 to 90.

Prevalent Diseases.—Ringworm, 115 cases discharged cured; yaws, 49; pulmonary tuberculosis, 10; typhoid fever, 7.

General Sanitary Work.—A drainage scheme was ordered and carried out for the Colonial Sugar Refining Company's European settlement. During the typhoid epidemic four Indian huts were burned, one store was disinfected, and other steps were taken to prevent any further infection.

Meteorological Conditions.—There have been 82 in. of rain during the year. The climate is very dry and good for this Colony.

J. F. E. Prideaux.

Ra.

Population:—

Race	Males	Females	Total
Fijian	— ..	— ..	6,687
Indian	827 ..	452 ..	1,279
European ..	44 ..	19 ..	63
Half-caste ..	24 ..	17 ..	41
Total	..	..	8,070

Main Causes of Deaths.—The following are the diseases mainly responsible for the deaths during the year, with their relative mortality: Broncho-pneumonia, 11·4; phthisis, 11·1; diarrhœa, 13·2; dysentery, 6·2; weakness, 6·9.

A good supply of instruments has been procured by the Company. A European hospital attendant has been procured, and the whole result is an enormous improvement upon the former insanitary and inadequate single building. The water supply is one 6,000-gallon tank, one 400-gallon tank, and one well.

Main diseases treated at the hospital were diarrhœa, pyrexia, conjunctivitis, ulcers, dysentery. There is a large decrease in diseases of the intestinal region.

Main Causes of Deaths.—Diarrhœa, 8; meningitis, 2. No other disease was responsible for more than one death. There was only one death due to dysentery.

Plantation Lines and Sanitation.—Penang Estate: The lines are now much better kept than formerly. A chain of land has been cleared around them and the grass between the houses kept short.

The Latrines: New latrines have been constructed according to plans based upon those of the latrines at Ba. There are twenty-nine such latrines.

Caboni Estate: The lines are very well constructed and maintained in good order. The site is a good one, well drained.

Ellington Estate: The lines on this estate, although adequate for the needs of the labour, have only recently been altered to conform to the regulations. The site is a good one and in very good condition.

Native Hospitals.—There is only one native hospital in this district, which is situated at Nanukaloa. The hospital consists of the following permanent buildings: Male ward, female ward, four small isolation wards, a dispensary and operating theatre, store, two bath-rooms, kitchen, and the following native buildings: native medical practioner's house, labourer's house, *post-mortem* room, store room, three houses for ringworm. A new ringworm house was erected, and for some time past a sulphur box for treatment of this disease has been used with good results.

The main diseases treated were yaws, tinea imbricata, filariasis, dysentery, broncho-pneumonia, phthisis.

Hospital Latrines.—The earth-pit type of latrine has been installed at the hospital on the high ground behind. Each pit has a separate house. They seem to be quite satisfactory.

Native Town Sanitation.—The sanitary state of the town has, I think, definitely improved during the year. The vast majority of the towns are situated on quite satisfactory sites. The great majority of the houses in the towns are clean, although promiscuous expectoration indoors does not help in this direction. It is noteworthy that windows are being introduced into the more recently erected houses. As far as I can judge, from my own experience, the drinking-water of the towns, when taken from the source that is supposed to be used for the purpose, is almost without exception quite good.

On the whole, the free coolie settlements are far from sanitary. The site of most of the houses is bad. The source of water supply is, I think, without exception, from wells, which are dangerous, as buckets are lowered into them.

Colonial Medical Reports.—No. 37.—Fiji—(*continued*).

THE staff of the hospital at Nanukaloa have spent a considerable amount of time and energy upon the improvement of the sanitary state of the district. In all 143 visits have been paid to the towns of this district. The staff have endeavoured to teach the natives the part played by flies and mosquitoes in the transmission of dysentery, diarrhœa, cika, enteric fever, filariasis, and dengue fever. Drains seem to be looked upon as the correct place to throw all rubbish. Efforts have been made to have the drains kept clean. There is no doubt whatsoever that the abolition of the closets over streams and sea—which formerly were one of the main breeding-places of flies near towns—has improved the sanitary state of the district, and it is to be hoped that the new closets will also help in the matter of this improvement. Considerable improvement in the general level of cleanliness of the houses has been effected by the demolition of the oldest ones and the erection of new. The drinking-water in the towns is almost universally good, and in the great majority of cases is taken from a separate stream from that used for bathing and washing.

J. T. SMALLEY.

CAKAUDROVE.

Population (approximately).—European, 110; Indian (free), 119; Indian (indentured) 24; Polynesian and Fijian, not known.

Health of District.—This, I think, may be considered satisfactory on the whole, *i.e.*, no worse nor better than other districts.

Dysentery is not common; a few sporadic cases have occurred. The type observed appears to be of the bacillary variety. No deaths from this cause have come to my notice. The Fijian villages appear to be particularly free from this disease.

German measles is common, in fact epidemic, in parts of Natewa Bay. It generally affects whole families, particularly the women and children, and does not appear to be attended by any bad results.

Phthisis is fairly common. This can, I think, be attributed to the insanitary system the natives adopt of sleeping with closed doors on dirty floors, or herded under dirty mosquito-screens made of close material.

Tinea imbricata is very common, especially on the north side of Natewa. The south side of Natewa Bay is strangely enough almost free of this disease. In Savusavu Bay, this disease is common in Wailevu West.

Frambœsia is common, especially in Savusavu, where inoculation is said to be widely practised on children.

Bronchitis is very common among children and is probably the most fatal of all diseases, and causes more deaths among them than all other diseases put together. In no town I have visited has the proportion of children affected with coughs and colds been less than 1 to 2 per cent. of healthy children of the children I have examined. No mortality figures can be given.

The water supply is stored water in closed tanks for drinking purposes, and creek water for bathing. The hospital accommodation is bad, and of latrines there are none.

On most estates creek water is used for drinking purposes.

Latrines of any description are unknown. The danger attending this omission is not so great as might be, owing to the fact that all the estates are near the sea and doga swamps. I have not found anything offensive on any estate which might be attributed to the absence of latrines.

Native Hospitals.—In October, a temporary bure was erected on some Government property attached to the stipendiary magistrate's station. This has proved very useful within limits of size and general convenience. This is the only hospital accommodation in the district.

Native Town Sanitation.—Creek water principally; also conserved roof water from houses with iron roofs. There are a few cement storage tanks. In some districts during dry weather, good drinking-water can only be procured at a distance, and is scarce.

Latrines.—No system of latrines exists in this district. The bush, shore, tidal creeks, and doga swamp are used. This is not a great evil, as there are few large rivers with towns higher up on their banks, and their water, though open to contamination, can be used for drinking purposes.

Meteorological Conditions.—These have not been recorded. The last quarter of the year has been exceptionally dry, and at times almost amounted to drought.

F. NANGLE SMARTT, M.B.

ON THE TREATMENT OF FIJIAN YAWS AND SYPHILIS IN INDIANS BY "606" IN 1911.

Dr. P. H. Harper, resident medical superintendent, Colonial Hospital, says: During the last four months 51 cases of yaws and 15 of syphilis have been treated at the Colonial Hospital, Suva, with salvarsan (606). The following table shows the nationality of the patients treated and the methods employed:—

Nationality	Cases of Syphilis		Cases of Yaws	
	Male	Female	Male	Female
European	1	0	0	0
Fijian	11	10	0	0
Indian	4	0	11	4
Samoan	3	4	0	0
Half-caste (Fiji-European) ..	0	2	0	0
Wallis Islander ..	1	0	0	0
Total ..	20	16	11	4

After fully reporting his methods and their effects upon the cases treated, he came to the following

CONCLUSIONS.

(1) The drug did not appear to have a selective influence on any of the races treated. The greater liability of Fijians to albuminuria following intravenous injection is only apparent and is, in my opinion, due to the fact that yaws is a more severe disease than syphilis. But no observations were made on the effect of salvarsan on the filaria. One of the Fijians, however, who did not develop albuminuria after intravenous salvarsan, was the subject of filarial elephantiasis.

(2) Local treatment of yaws granulomata and ulcers by scraping, &c., is not called for, as the unhealthy protuberant granulations at once break down, to be replaced by healthy red healing granulations. Graft operations and excision of the scars left after the healing of ulcers of many years' duration are useful in some cases.

(3) Local reaction was severe in only one case.

(4) The best results were obtained by the intravenous method. The intramuscular is preferable to the subcutaneous method.

(5) The results of treatment by serum from blisters obtained on treated patients are doubtful, and the method was only tried when the debility or age of the patient was considered a contra-indication to intravenous injection.

(6) The treatment of yaws by salvarsan is our most economical line of treatment. In January and February, 1911, before salvarsan was used the average stay in hospital of yaws patients was over forty-five days, although this includes several minor cases who were in only a day or two. The average stay in hospital of yaws patients treated by salvarsan will be under twenty days, probably under eighteen days.

(7) Cases which were hopeless of cure when treated by other methods were apparently cured when treated by salvarsan.

Colonial Medical Reports.—No. 38.—St. Kitts-Nevis and the Island of Anguilla, Leeward Islands Colony.

MEDICAL REPORT ON THE PRESIDENCY OF ST. KITTS-NEVIS AND THE ISLAND OF ANGUILLA, LEEWARD ISLANDS COLONY.

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POPULATION, BIRTH AND DEATH-RATES.

Statistics of Population in the Presidency of St. Kitts-Nevis.

	St. Kitts	Nevis	Anguilla
Estimated number of inhabitants in 1910	30,185	14,971	4,894
Estimated number of births during the year 1911	949	545	180
Estimated number of deaths during the year 1911	749	323	80
Estimated number of inhabitants in 1911	30,385	15,193	4,994
Estimated number of increase	200	222	100
Number of inhabitants at census on April 1, 1911	26,283	12,945	4,075

The above table is calculated, as heretofore, on an estimated population of the previous year and gives a death-rate as follows :—

St. Kitts.—24·650 per mille against 26·45 per mille in the previous year.

Nevis.—21·259 per mille against 21·57 per mille in the previous year.

Anguilla.—16·019 per mille against 19·41 per mille in the previous year.

The birth-rate estimated on the same basis is as follows :—

St. Kitts.—31·232 per mille against 32·93 in the previous year.

Nevis.—36·871 per mille against 37·94 in the previous year.

Anguilla.—36·043 per mille against 42·70 in the previous year.

BIRTHS, STILL-BIRTHS AND DEATHS (EXCLUSIVE OF STILL-BIRTHS IN 1911).

	Living births	Living birth-rate per 1,000 of inhabitants	Still-births	Still-birth-rate per 1,000 of inhabitants	Deaths exclusive of still-births	Death-rate per 1,000 of inhabitants exclusive of still-births
St. Kitts	849	27·941	100	3·291	649	21·359
Nevis	500	32·909	45	2·961	278	18·311
Anguilla	174	34·841	6	1·201	74	14·817

In the previous year (1910) these rates were as follows :—

	Living births	Still-births	Deaths, exclusive of still-births
St. Kitts	30·23	2·79	23·66
Nevis	36·13	2·40	19·17
Anguilla	40·86	1·85	11·64

The following table of legitimate and illegitimate births is not without interest, from the invariable fact that the mortality among the illegitimate is greater than among the legitimate, and that many of them are still-born shows clearly how unfavourable their position is from the first.

LEGITIMATE AND ILLEGITIMATE BIRTH-RATE FOR 1911.

	Legitimate births	Illegitimate births	Legitimate birth-rate per 1,000	Illegitimate birth-rate per 1,000
St. Kitts	322	627	10·507	20·635
Nevis	212	333	13·953	21·917
Anguilla	79	161	15·818	20·224

Infantile mortality, considered as the annual number of deaths of infants under 1 year of age to

every 1,000 births, is still high in the Presidency, as the following table shows :—

	Number of deaths under 1 year	Rate per 1,000 of births
St. Kitts	260 ..	273·972
Nevis	148 ..	271·559
Anguilla	31 ..	172·2

The causes of infantile mortality are common to the whole island, and the chief of them is improper food and methods of feeding, the improper substitution of farinaceous for milk food; the use of uncleanly bottles containing milk in an incipient state of putrefaction is a common source of infantile diarrhœa. Convulsions are very commonly due to the irritation produced by improper feeding; prematurity and congenital defects in connection with the health conditions under which the mother lives have an undoubted influence on the vitality of her progency, and so too have hereditary tendencies, such as the inheritance of syphilis.

Public Health.

The general health of the Presidency during the year was good, and there was nothing noteworthy. No disease of a quarantinable nature visited our shores, and the Quarantine Station was not requisitioned for such purposes.

Leprosy.—There were 60 cases in the lazaretto on January 1, 1911. There were 7 admissions during the year—3 males, 4 females—making a total of 67 treated for the year; of these 6 died. There were no discharges. Leprosy is spread by direct and indirect contagion by persons suffering from the disease. The possibility that indirect contagion may be effected by fleas, bugs, lice, &c., has to be borne in mind. Leprosy is most prevalent under conditions of personal and domestic uncleanliness and overcrowding, especially where there is close and protracted association between the leprous and non-leprous. The evidence as to the Nastin treatment of this disease is conflicting, and we must await the result of experiments on a large scale; Deycke reports its use as effective in clinical practice. The results of treatment from it in a leper asylum in British Guiana were favourable, the swellings in the tuberculous forms retrograded, and in the nerve cases improvement seemed good, especially as regards the spots on the skin and the anæsthetic areas; the drug produced no ill effects, and the general health of the patients seemed improved.

Yaws was placed on the notifiable list for part of the year, and showed no decline in its prevalence, being endemic in some parts of the country districts. This disease has been successfully treated with "606" (salvarsan), and from the remarkably successful results obtained in the Trinidad Hospital it may be looked upon as a specific in its treatment

Enteric or *Typhoid* has prevailed during the year, causing 13 deaths. There were no explosive outbursts of the disease; the difficulty of tracing the source of the infection was very great, and in the majority of cases could not be arrived at.

The Medical Officers report as follows :—

Dr. Nurse (District No. 1) says :—

During the last two quarters of the year the district has been fairly healthy.

Cases of diarrhœa and dysentery, which are generally prevalent during the fall of the year, have been few, especially among the children.

I have had only one case of malarial fever in the district.

The parish of Trinity has been exceptionally healthy.

Dr. McDonald (District No. 3) says :—

The public health in District No. 3 during 1911 has been very satisfactory. The death-rate has been exceptionally low.

There were a few cases of typhoid fever at the beginning of the year. One of the last cases occurred in my own house. This was a very severe case, the fever ranging up to 104° F. and continuing for ten weeks, the chief symptoms being continued fever, tympanitis and intense jaundice lasting two weeks; during convalescence the patient suffered from parotiditis (mumps), which according to the textbooks is almost always fatal. Two of the other cases in the district showed intense jaundice. One of the cases died from a relapse and exhaustion.

Two new dispensaries were established at Tabernacle and Parson's Ground.

During the year 6,089 patients were attended at the three dispensaries in the district.

Midwives.—Those instructed by me and supplied by the Government with materials for carrying on their work have done very well. There has been a marked diminution of cases of tetanus in the newborn, and also in cases of still-births. Tetanus is almost a thing of the past.

I am very glad to report that the sanitary condition of District No. 3 is now in a very satisfactory way and has greatly improved during the year.

In the formation of the District Sanitary Board the object aimed at was to appoint members who move a great deal among the people of the district, and who thus have many opportunities of instructing the people, and of noticing and correcting any insanitary conditions.

Each member of the Board has been asked to act as a kind of sanitary inspector for his own immediate neighbourhood, to instruct the people in sanitation on all occasions, to help the people improve their sanitary conditions, and specially to notice and report any insanitary conditions in their neighbourhood.

At the start the members realized that there were three important objects that they must pay particular attention to :—

Prevention of breeding and destruction of flies;

Prevention of breeding and destruction of mosquitoes;

The proper disposal of night soil.

There are three sanitary inspectors, one for St. Mary's, one for Christ Church, and one for Tabernacle and Stonecastle.

The chief duty of the sanitary inspectors is to inspect houses and premises in order to discover and remove nuisances and insanitary conditions.

The method of inspection is :—

House.—Note anything in surroundings which might injuriously affect it; whether shut in, and amount of free air space and light available. Note any evidence of dampness (under the house or in the walls), dirtiness or overcrowding, or any collection of rubbish under the house.

Yard.—See whether surface drains are in good repair, whether the yard is damp, whether there is any collection of rubbish in the yard. Find out if house refuse is regularly collected and put out, and whether any animals such as pigs, poultry, &c., are kept, and how kept. Note any breeding places of mosquitoes.

Excreted Refuse.—Find out method of disposal, and note condition as to cleanliness.

Cesspit.—Find out if there is any leakage or offensive smell.

Pail Closet.—Find out if contents are kept dry, and how often pails are changed.

Water Supply.—Find out how obtained, and methods and arrangements for storing.

Note any trade business in the vicinity likely to cause annoyance or discomfort.

General Remarks.—On account of the persistent efforts of the members of the Board of Health and of the sanitary inspectors, the district has been particularly free from mosquitoes. The sanitary officers on their weekly rounds sometimes find mosquito larvæ breeding in water in estate coppers, barrels and other receptacles. The water is either immediately emptied out or supplied with "millions."

The most likely breeding places for mosquitoes in the district are the mould traps or holes at the sides of the public roads. The gutters, trenches and holes at the sides of the public roads are seldom cleaned out, and often contain stagnant water for months at a time, thus becoming ideal breeding places for mosquitoes. I have repeatedly obtained mosquito larvæ from stagnant water in these holes. With a little expense and trouble these breeding places of mosquitoes could be easily destroyed.

It is with great pleasure that I record the splendid results achieved at "Mansion Estate" by the manager, Mr. D. Todd. Mansion Estate is a model of cleanliness and proper sanitation and an example to all the other estates. All collections of water that cannot be emptied are regularly supplied with "millions," therefore Mansion Estate is always free of mosquitoes, even in the bad "mosquito season."

Dr. Foreman (District No. 4) says:—

There was nothing unusual to report in District No. 4 during the year 1911, except the building of cemented gutters at Dieppe Bay and at Sandy Point, which were much needed. It makes a great improvement in the sanitary condition of these places. There is no more stagnant water about the streets and private yards, and there are certainly fewer mosquitoes.

I am glad also to report that public latrines are being erected at Dieppe Bay. I hope that people will make use of them, and that ankylostomiasis will soon be less prevalent in that village and its neighbourhood.

I think the notification of cases of yaws has done some good, as patients above 9 years old were provided with gratuitous treatment as well as the younger ones, with the result that most of the cases were cured. However, there are a few fresh cases in the villages of Fig Tree and Godwin Gut.

Dr. McPherson (District No. 5, Anguilla) says:—

The health of the district during 1911 has been fair. An epidemic of typhoid fever occurred during the latter three months of the year. Up till December 31, 16 cases, with 1 death, occurred.

All the persons affected lived within a radius of a quarter of a mile. No obvious source of infection could be discovered, but it is undoubtedly the house-fly which acts as a carrier.

The prolonged drought during the summer months caused great scarcity of grounds, provisions and consequent hardship to the poor.

The total number of deaths was 78, as compared with 89 for last year; 27 of the number were under 1 year of age, and of the 27, 7 were still-births.

Malaria, Ankylostomiasis, Yaws, Filariasis have been entirely absent, excepting a few imported cases of the first-named.

Dysentery and *Diarrhœa* have been frequent.

Infantile Diarrhœa caused 12 deaths of those under 1 year.

Tuberculosis in various forms is fairly common and accounted for 9 deaths.

One imported case of *Pellagra*, which proved fatal, occurred.

A trained midwife has been at work in the district for eight months of the year and has been of considerable service.

There were 91 successful vaccinations. The scattered dwellings and bad roads make it difficult for mothers to carry their children to the places appointed for vaccination and a certain number escape from this cause.

Five major operations were performed locally, and one patient was sent for operation to the Cunningham Hospital.

Dr. Rat (District No. 6, Nevis) says:—

The health of District No. 6 during 1911 has been good. There was no general epidemic during the year. The only departures from the normal were the prevalence of dysenteric diarrhœa during the last quarter and the occurrence of three cases of pneumonia, in two of which the disease was contracted in St. Kitts.

One hundred and sixty-four deaths were reported, 45 among children under 1 year of age, 18 among those of from 1 to 10, 3 among those of from 10 to 15, 1 among those of from 15 to 20, and the rest among adults.

The largest number of deaths, viz., 35, was due to diarrhœa. Eleven deaths resulted from malarial fever, 9 from tuberculosis, and 6 from syphilis. Ten children died from congenital debility within a few days of their birth; and among adults 8 from old age. The remaining deaths were divided among the several diseases to each of which fewer than 6 deaths are attributed.

There was nothing exceptional in the health of the adult population except the prevalence of dysenteric diarrhœa already mentioned. The cases appeared during the last quarter after a long drought followed by heavy rains. One of the drudges employed at the Alexandra Hospital was attacked with this disease, and, after a relapse, showed signs of liver abscess. A dome-shaped swelling about 2 in. in diameter at the base was observed in the epigastrium. It was exceedingly painful and was attended by continued fever. It, however, disappeared under treatment with quinine internally and ichthyol and mercury externally, without developing pus.

Colonial Medical Reports.—No. 38.—Leeward Islands— *(continued.)*

Of the 248 children born in the district, 20 were stillborn. The mortality among the remainder was 45. This gives a mortality of 19·7 per cent., which is about 5 higher than the corresponding average figure for England. As many as 18 died before they had completed the first month of their existence. Ten were too feeble at birth to live beyond a few hours or days, and their deaths are recorded as due to congenital debility, but some of these must have been affected with hereditary syphilis. The other eight died of such diseases as trismus, of which it is interesting to note that there were only two cases, convulsions, umbilical hæmorrhage, hæmophilia, gastro-enteritis and cellulitis. Diarrhœa, of which there were 19 fatal cases, was the chief cause of death. While there were only 5 deaths from it during the first half of the year, 14 occurred in the latter half, as many as 12 having taken place in the last quarter. The diarrhœa which prevailed among the infants during the last three months was of the same type as that which affected adults during that time. It was attended by colic and discharges of blood and mucus.

The mortality among children under 1 year of age was due to the following diseases in the following proportions: Congenital debility 10, diarrhœa 19, syphilis 4, convulsions 1, hæmophilia 1, malarial fever 3, trismus 2, bronchitis 1, umbilical hæmorrhage 1, gastro-enteritis 2, cellulitis 1.

METEOROLOGICAL RECORD.

Rainfall in the Presidency in 1911.

	St. Kitts		Nevis		Anguilla
	Buckley's Leeward side of Island	Hermitage Windward side of Island	Cane Garden Leeward side of Island	New River Windward side of Island	Centre of Island
January	5·23	3·41	6·82	2·23	2·36
February	5·79	7·03	3·05	1·87	3·13
March	2·16	3·27	1·33	2·10	0·88
April	1·97	1·09	3·16	2·00	5·34
May	3·65	5·54	3·35	2·80	1·77
June	2·13	2·50	1·24	0·23	0·46
July	3·97	2·02	2·68	1·09	0·80
August	2·64	2·77	3·08	1·96	0·83
September	4·64	4·22	5·70	4·82	0·88
October	4·96	4·69	3·70	4·14	3·61
November	3·64	4·07	2·93	3·18	4·21
December	6·73	8·06	7·88	7·10	7·90
Total	47·51	48·67	44·92	33·52	32·17
1910	42·15	44·37	41·54	31·85	32·35

METEOROLOGICAL RETURNS FOR 1911.

Months	Minimum	Maximum	Range	Mean temperature	Rainfall
January	68	81	13	77·8	4·98
February	66	82	16	76·9	4·51
March	65	83	18	78.3	2·30
April	70	86	16	81·4	1·36
May	71	85	14	81·9	4·37
June	73	86	13	84·1	2·25
July	74	88	14	84·1	3·34
August	74	91	17	85·7	2·18
September	72	89	17	84·6	3·49
October	73	90	17	84·6	4·92
November	74	88	14	81·7	3·02
December	71	86	15	79·6	6·37
Total	..	..	..	81·7	43·09

Mean temperature for year, 81·7.

GENERAL AND SANITARY.

The Presidency is in a fairly good sanitary condition; several cemented drains have been introduced into the parts of the town of Basseterre where there was no drainage previously, and extension of existing drains in others. Increase in the number of latrines must have a sanitary effect. As before reported there is overcrowding in many parts of the town. The water is good and wholesome. The Mosquito Ordinance has been enforced in the whole Presidency, and some attempts at the extermination of those pests have been made, though their destruction is still looked upon apathetically by the majority of the people; stocking of ponds and ornamental waters with the small fish "millions," known as voracious devourers of the mosquito larvæ, have had some effect in reducing their breeding spots. It would be advisable to cut down more brushwood in the neighbourhood of dwellings, and to fill up hollows and pools of stagnant water. The method of collection of night soil is unsatisfactory from a sanitary point of view. The careful collection and disposal of house refuse is a measure of primary importance against the deadly "house-fly," and adequate means should be taken to prevent the access of flies to foodstuff; measures should be employed to screen the kitchens and latrines against them; cleanliness should be maintained in the house, so as to deprive the insects of food and breeding places.

INSTITUTIONS.

Dr. Edmund Branch, Medical Officer of the Cunningham Hospital, reports as follows:—

There were 838 cases treated in the wards of Cunningham Hospital and 88 of these ended fatally, giving a death-rate of 10·5 per cent. which is about the annual average.

Among the deaths 20 were from old age. This item, which is owing to the want of a poor house in this island, unfairly increases every year the death-rate of the hospital.

The attendances on out-patients were 2,355.

The operations performed during the year amounted to 110, giving the low death-rate of 1·8 per cent.

There are a few points in the nosological list which perhaps deserve brief comments here.

The number of cases (12) of malignant growths was large comparatively with most of the other ailments on the list. Papain was administered internally, as a routine treatment, whether the cases were inoperable or had been operated on, and the latter class were instructed to continue to take it steadily after leaving the hospital. This was done in accordance with the suggestions contained in certain articles in the *British Medical Journal* to the effect that the extraordinary power of papain, when injected into the centre of a scirrhus, to digest cancerous tissues, encouraged the idea that the drug might act destructively on whatever constituent of the blood favoured the genesis and growth of cancer. I may be excused for mentioning here a case in my private practice, the more so as it influenced the treatment of one of the 12 cases above mentioned. A lady, aged 45, consulted me on her arrival in St. Kitts. She had been treated in America for

scirrhus of the breast, first by the Röntgen ray and then by amputation. She was emaciated to a degree and presented so extraordinary an appearance that I am almost afraid to describe it. Every gland in her body from her neck to her legs was indurated and could easily be felt. She was undergoing agonizing pains in all these lumps. Six months had elapsed from the date of amputation of the breast. I put her on the internal papain treatment. In six weeks the cancer nodules and the pain had disappeared. She died in about two months from the almost sudden disappearance of her hard lumps, but her death was an easy one, as from exhaustion. During the last two months she was free from pain.

Just at this time a woman, whose breast had been amputated for scirrhus, came into the hospital with a hard secondary cancer nodule the size of a pigeon's egg in one corner of the mammary cicatrix. I intended to remove this cancer, but put her in the first instance on papain internally. In a week the tumour was smaller and in about eight weeks she left the hospital without any trace of it. I saw her three months after and it had not returned. She took papain for a long time after leaving the hospital.

The first case operated on in the Leeward Islands with the help of quinine and urea hydrochloride is among those mentioned in this nosological list under the heading of malignant growths. It seems to me necessary therefore to give a brief description of the case in these notes. The patient, a white gentleman aged 77, came from one of the neighbouring islands. He had an epitheliomatous cancer involving nearly the whole of his lower lip and another and larger growth of the same nature on the mucous membrane of the right cheek. His heart sounds were very weak, and he was extremely feeble, chiefly from prolonged semi-starvation. He had consulted several doctors, who rightly decided that he could not be safely put under chloroform. They also thought that the growths could not be extirpated without leaving a horrible appearance from the mutilation of his face. Under these circumstances they all declined to operate. With the concurrence of my colleagues, Drs. Fretz and Nurse, I removed the growth and secured enough flaps from the neighbouring parts to obviate completely any deformity. Dr. W. J. Branch kindly managed also to be present at the operation. The proposed lines of incisions were anæsthetized by numerous hypodermic injections of quinine and urea hydrochloride. The patient groaned twice during the operation but remained quite still. The skin was devoid of sensation, but the mucous membrane over the part of the buccal growth that projected into the mouth was still a little sensitive, and he groaned when the instrument pressed on it. No less than 200 drops of a 1 per cent. solution of the drug were required to effect the anæsthetization. The incisions were not begun till the lapse of twenty minutes after the last hypodermic injection. If I had injected some of the drug into the body of the buccal tumour, as well as round its base, the operation would, I think, have been perfectly painless. The wound healed by the first intention. He left the hospital in three weeks. He was put on the usual internal papain treatment. I had a letter from his daughter three weeks ago, that is to say five months after the operation; no disfigurement of the face resulted from the removal of the tumour, and there had been no appearance of a return of the disease up to now. His general health and spirits are excellent. In spite of the size and long continuance of these growths, the glands under the jaw never became affected.

The Cunningham Hospital has had for many years a sort of traditional good reputation for the successful treatment of tetanus. The treatment that has always been relied on by my predecessors as medical officers of the institution is by chloral, often given heroically. At any rate chloral was given in tetanus by the doctors in St. Kitts almost from the time when the drug was first introduced into medicine. I have been informed that the late Dr. Dinzey was very successful in treating with it tetanic cases in his country practice. This year I include two recoveries out of three cases of tetanus after wound. All of these were treated with chloral.

The Gaol.

Sixteen persons were sent to the Cunningham Hospital for treatment and 62 were treated in the institution itself for trivial ailments. There were no deaths among the prisoners during the year.

The sanitary condition of the entire institution remains, as usual, excellent, and the whole place is kept scrupulously clean and tidy.

Alexandra Hospital, Nevis.

Dr. Rat reports as follows:

There were 256 admissions into the wards, of which 109 were males and 147 females.

The deaths numbered 16. Of these, 9 occurred among the male and 7 among the female patients.

The mortality, according to sex, was, males, 8·2 per cent.; females, 4·7 per cent.: The total mortality was 6·2 per cent.

There has been a marked improvement in the mortality since the removal of the patients from the old infirmary in Charlestown, where the average number of deaths among the hospital patients—not including the poor house inmates—was 17 per cent. during the period 1899 to 1906.

The diseases and injuries for which the largest numbers of admissions were made were malarial fever, syphilis, elephantiasis, lymphadenitis, heart disease, pharyngitis, eye disease, genito-urinary diseases, ulcers, injuries.

There were 36 operations performed under anæsthetics.

Return of Diseases and Deaths in 1911 in the Cunningham Hospital,

Leeward Islands Colony.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	12	—	12
Anæmia	1	—	1
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	5	—	7
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	4	—	4
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	1	—	1
Filariasis	—	—	—
Gonorrhœa	14	—	14
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	3	—	3
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	3	—	3
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	5	—	5
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	5	1	5
Malignant	12	—	12
Old Age	—	—	—
Other Diseases	66	27	76
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	16	—	17
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	—	—	—
(*a*) Primary	16	—	16
(*b*) Secondary	90	13	103
(*c*) Tertiary	—	—	—
(*d*) Congenital	4	—	6
Tetanus	3	1	3
Trypanosoma Fever	—	—	—
Tubercle—	24	10	27
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	24	—	24
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	6	5	7
(*b*) Other Diseases	6	3	7
Digestive System—	—	—	—
(*a*) Diarrhœa	25	5	24
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	6	2	8
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	109	1	111
Ear	3	—	3
Eye	20	—	24
Generative System—	—	—	—
Male Organs	14	—	15
Female Organs	15	—	15
Lymphatic System	3	—	3
Mental Diseases	23	—	29
Nervous System	17	3	21
Nose	1	—	1
Organs of Locomotion	19	—	23
Respiratory System	21	2	22
Skin—	22	—	25
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	24	5	25
Injuries, General, Local—	64	4	67
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	59	7	67
Ascaris lumbricoides	1	—	3
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	1	—	2
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	10	1	10
Other Operations	93	1	95
Eye	7	—	7
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Colonial Medical Reports.—No. 39.—Durban Corporation.

MEDICAL REPORT FOR THE YEAR ENDING JULY 31, 1911.

By P. MURISON, M.D., B.Sc., D.P.H.

Medical Officer of Health.

During the past year public health affairs have been of such a kind as to excite very little public attention. There has been an entire absence of epidemics or even serious outbreaks of infectious diseases. An important aim of public health departments is to *prevent* such occurrences; it is only when this function has not been successfully exercised that the secondary one of "fighting it," as the phrase goes, comes into operation. Plague, smallpox and malaria have now been absent from this borough for several years, and unless any one of these diseases should again appear all reference to these diseases will be omitted in future annual reports. The only disease which occasioned any uneasiness was a somewhat sudden sharp outbreak of epidemic diarrhœa, which occurred in January, and lasted about five weeks. It was diagnosed and notified as dysentery by some medical practitioners, by others it was considered muco-enteritis.

The number of cases of infectious disease occurring in the borough during the past year has considerably increased. The diseases that are chiefly responsible for this increase are dysentery, enteric, and phthisis. Diphtheria shows a marked decrease. Each case on being notified by the doctor in attendance is immediately visited and kept under close supervision during the course of the illness and until the process of disinfection has been carried out.

Since 1907 a considerable change has come over Durban owing to its development as a health and holiday resort, which has produced one or more points demanding notice from a public health aspect. Owing to the permanent as well as the changing attractions provided during the winter months, we have a sudden influx of a European temporary population added to our own. A very considerable portion of this population consists of young children liable to infectious diseases. When a case of infectious disease occurs in such places, uneasiness, if not alarm, is produced amongst other guests, particularly the parents or guardians of children. The only method of allaying such alarm is by the immediate removal of the sufferer to a suitable isolation hospital.

The want of more adequate provision for the isolation and treatment of cases of infectious diseases is particularly noticed during the winter and summer seasons when the borough has its housing capacity tested to the utmost.

From some considerable personal experience I would venture to suggest that it would be highly advantageous both to the borough and visitors if the municipality would exercise greater control over accommodation provided for visitors, and more particularly in the letting of lodgings. It would be a highly appreciated service if an Information Bureau for visitors intending to visit Durban could be inaugurated by the Corporation.

Native Location.

When plague and smallpox invaded this municipality these diseases were noticed to spread amongst our Native population quite as rapidly as amongst Indians, and quite as many fatal cases occurred amongst Natives as in any other race, while owing to their habits and circumstances Natives are exceptionally active agents in the spread of infectious disease.

The Corporation during the past year have condemned several blocks of buildings, occupied by their coloured employees, which were erected ten years ago, and to accommodate the population so de-housed, are erecting several blocks of buildings adjacent to the Magazine Barracks that will serve as models for all other employers of coloured labour.

In these dwellings, light, ventilation and air space have received particular attention, and instead of being the usual back to back wood and iron sheds, are built of brick and hollow concrete blocks, and provided with through ventilation.

One half of the total population of this borough consists of Natives and Indians, and as the weakest link of any chain determines its strength, so the health of the European population depends to a considerable extent on the health and sanitary conditions of those with whom they are brought into contact.

Additional Public Health and Sanitary Powers.

Fairly wide powers are now available for controlling all food-stuffs sent into the Borough, and more particularly for the examination of all foods and articles intended for human food, their seizure, removal, and destruction if found to be diseased, unsound, or unfit for food of man, and imposing penalties including imprisonment on conviction of any person exposing for sale, selling, transmitting, or depositing for sale, such food or articles. Under previous legislative powers it was impossible to deal with persons living outside the Borough who sent into Durban for sale food or articles unfit for human consumption. Under powers conferred by this Ordinance such persons can be dealt with in a similar manner to those whose trading premises are within the Borough.

Colonial Medical Reports.—No. 39.—Durban Corporation. *(continued.)*

It is recognized that the stabling, shedding and kraaling of animals in municipalities should be under more efficient control, and amongst several important provisions of this ordinance there is one dealing with the power to restrict the number of animals to be kept in such places. It is highly undesirable to kraal animals within the borough unless remote from all dwelling-houses or work-places.

Powers have also been given for dealing with hair-dressers' and barbers' premises, in order to secure, amongst other things, protection of customers from inoculation of cutaneous and other diseases.

Government Primary Schools.

During 1906 a careful inspection of all primary schools in Durban was made by this department, the result of which was to show that in many of these schools various kinds and degrees of insanitary and defective conditions existed. On the strength of a detailed report, the Town Council communicated with the Education Department and Government on the subject. It was recognized by all parties that modern school buildings must be provided, sufficient in number and size to cope with the wants of this community. The history of progress in Durban during the past three years in the direction of school accommodation can only be regarded as phenomenal.

Medical Inspection of Scholars.

It will be perceived from what has been stated regarding schools that the Borough of Durban will shortly be supplied with adequate and proper school accommodation. However desirable and essential that provision may be, another important factor exists requiring careful consideration. It is now recognized that children attending schools may require attention for the purpose of discovering any physical or mental defect capable of prejudicially affecting a scholar's physical development or intellectual progress into a perfect citizen. Such defects may not be recognized by or known to their parents or guardians.

In considering this question the first point requiring to be settled is: Does the same necessity exist in Durban for medical inspection of scholars as in other parts of the world where such inspection has been found so necessary and advantageous? That question can only be answered by a trial examination of a considerable number of mixed pupils. An application has been made to Government recommending that permission be granted for such trial examination, and the suggestion has been made that a medical inspection of the scholars attending a mixed school would furnish sufficient statistical facts to answer the above question. I expect to hear shortly that the Government has sympathetically considered this proposal.

Infectious Diseases.

During the year the Health Officer for the colony recommended the closure of schools to prevent the spread of infectious diseases.

This step would only be taken in exceptional circumstances, and that duty will now be carried out by this Department. Any action is duly notified to the Health Officer for the colony, the date of closure of the school, the reasons for the closure, and the date of re-opening.

Vital Statistics.

For several years past the Municipality has caused a census of the inhabitants to be taken, and this work has been carried out in an excellent manner. Up to the latest moment of sending in this report only a preliminary uncorrected census return has been made, consisting of the total numbers of the different races as follows:—

Europeans	31,903
Natives	17,750
Indians and other Coloured Races	19,512
Total	69,165

In the new method of grouping of races the only points of possible approximation to correctness in the above table is the number of natives and the total population. The preliminary return is not comparable with any previous censuses in its grouping. It will be noticed that St. Helenas, Mauritians, &c., are classed with Indians. In previous returns these persons have been grouped into a separate class, "mixed and others," and as these people adopt European habits, all returns of vital statistics relating to Natal or Durban have included them in the European population.

Estimate of Population, 1910-11.

Europeans...	31,903	34,000
Coloured and Half-Caste	2,497	
Natives	17,750	
Indians	17,015	

These figures show that a very healthy increase has taken place.

Natural Increase of Population of Durban, 1910-11.

Births	952
Deaths	301
	651 natural increase of population.

It is of importance in other respects than that of Public Health to have a census of the population of a community taken at frequent intervals. To know whether a population is stationary, increasing or decreasing, and more particularly if it is increasing, at what rate, affords valuable information of economic interest.

Table showing Monthly Distribution of Births for Race and Sex, 1910-11.

Months		Totals		
		Europeans	Asiatics	Natives
1910—August		75	50	2
September		91	50	3
October		85	51	1
November		82	67	2
December		80	34	0
1911—January		94	54	3
February		85	46	2
March		89	52	0
April		91	41	1
May		88	74	1
June		77	42	1
July		84	49	1
Totals		1,021	610	17
European birth-rate (gross)		29·7 per 1,000		
,, ,, (corrected) for non-residents		27·7	,,	
Indian birth-rate		35·9	,,	

The small number of births of natives occurring in Durban prohibits the stating of any birth-rate for that population.

TABLE SHOWING RACE AND SEX DISTRIBUTION OF DEATHS DURING THE PAST YEAR.

Race	Male	Female	Total
European	176	125	301
Native	82	27	109
Asiatic	172	133	305
Totals	430	285	715

TABLE SHOWING CAUSES OF NON-RESIDENT DEATHS.

	European	Native	Asiatic	Total
Dysentery	1	1	2	4
Enteric fever	3	0	0	3
Measles	0	0	1	1
Malaria	1	0	0	1
Venereal diseases	0	0	2	2
Puerperal fever	1	0	0	1
Phthisis	11	13	25	49
Tuberculosis, other than phthisis	4	0	9	13
Cerebro-spinal meningitis ...	0	0	6	6
Cancer	7	1	0	8
Old age	2	0	1	3
Diseases of nervous system ..	5	1	5	11
Diseases of heart and circulatory system	9	1	4	14
Pneumonia	2	6	3	11
Bronchitis	2	0	0	2
Other diseases of respiratory system	2	0	0	2
Diarrhœa, enteritis and catarrh	2	1	2	5
Other diseases of alimentary track	5	2	0	7
Diseases of urinary system ..	5	1	3	9
Diseases of child-birth	1	0	0	1
Accident	5	3	1	9
Suicide	2	0	0	2
Execution	0	1	0	1
Totals	70	31	64	165

The above table shows that a considerable number of people who do not usually reside in the borough come here to be treated for disease or injuries and succumb while here.

The deaths amongst the European population of Durban for the past three years show that there has been a considerable increase in the number during the past year as compared with the two previous years. This increase in the number of deaths is not confined to the Borough of Durban. Statistics are available for the first six months of 1911 for the whole of Natal, and they show an increase of nearly 50 per cent. of deaths as compared with the corresponding six months of the previous year. It has also to be remembered that our European population has somewhat increased. It will be noticed that the deaths from tuberculosis remain practically steady at an average of twenty European deaths per annum. It is to be remembered that these twenty deaths were those of people domiciled in the borough. Diseases of the intestinal track account for a large proportion of the increase of deaths occurring during the past year. A fair proportion of the increase of deaths also is due to injury and weakness at birth.

NATIVE DEATHS.

Natives (population, 1911, 17,750).—During the past year 109 natives have died in Durban.

	Adults	*Children	Total
Males	54	28	82
Females	6	21	27
Totals	60	49	109

ASIATIC DEATHS.

Indians (population 1911, 17,015).—During the past year 305 Indians have died in Durban.

	Adults	*Children	Total
Males	67	105	172
Females	43	90	133
	110	195	305

* "Child" means under 12 years.

INFANTILE MORTALITY.

	Male	Female	Total
Infantile deaths during 1910-11 ...	49	37	86
Registered births		952	
Infantile deaths		86	

This equals 90·3 infantile deaths per 1,000 births, and represents the "infantile mortality figure" for Durban, 1910-11.

	YEAR							
	1903-4	1904-5	1905-6	1906-7	1907-8	1908-9	1909-10	1910-11
Number of infant deaths	112	105	109	67	89	62	41	**86**
Infant mortality figures	100·3	88	100	69·2	91·7	67·3	45·4	**90·3**

VITAL STATISTICS.

JOHANNESBURG.

	EUROPEANS	COLOURED		
	Whites	Natives	Eur-african	Asiatics
Population	111,857	95,522	7,749	5,176
Birth-rate per 1,000	35·7	*	*	*
Death-rate (crude)	13·3	33·6	31·1	19·7
Death-rate corrected for age and sex distribution ...	15·2976	...	...	...
Infantile mortality	110	326		29·5
Death-rate from tuberculosis	0·97	4·74	2·45	1·15

* Not calculated on account of the very small number of women.

CAPETOWN.

	Europeans	Coloured
Population	30·476	37·055
Birth rate per 1,000	24·9	44·34
Death-rate (crude)	14·89	28·76
Infantile mortality	94·8	206·6
Death-rate from tuberculosis, non-residents	1·27	5·23
Gross	1·87	5·93

PRETORIA.

	Europeans	Coloured
Population	...	...
Birth-rate per 1,000	34·2	17
Death-rate (crude)	10·6	14·1
Infantile mortality	104	244
Death-rate from tuberculosis ...	0·2	2·4

BLOEMFONTEIN.

	Europeans	Coloured
Population	10,968	10,106
Birth-rate per 1,000	32·8	...
Death-rate (crude)	10	34
,, (corrected)	7·59	...
Infantile mortality	79·2	...

PLAGUE.

No cases of plague have occurred in Durban or amongst the shipping in Port Natal during the past year. Several cases, however, are reported to have occurred on the West Coast of Africa and Mauritius. On the latter island, during 1909, 248 deaths occurred from plague, and during the first ten months of 1910 165 deaths were reported.

SMALLPOX.

No cases of smallpox have occurred within the Borough of Durban during the past year. The s.s. "Sultan" arrived on September 28, 1910, having had a case of smallpox on board during the voyage in an Indian passenger. The Port Health Officer informed me that ninety Indian contacts were ready to be discharged from the ship. Consequently all these contacts were then removed to and quarantined on Salisbury Island by the Port Health Department.

VACCINATION.

We still continue to act as a lymph depôt for the convenience of medical practitioners in Durban. During the past year several complaints have been sent to the Health Officer for Natal concerning the lymph supply. I would repeat that the vaccination laws are not sufficiently administered. The Indian population is not well vaccinated; the European population very much less so.

DYSENTERY.

Sporadic cases of this disease continue to be notified from time to time, and from all over the borough. The cases of dysentery that are now notified are not to be compared with the cases of dysentery occurring eight or nine years ago. About December 20 the number of notifications of dysentery commenced to slightly increase, and by the beginning of January it was noticed that in the ten days twelve cases had been notified. During the five weeks this outbreak existed there were fifty-two cases notified as dysentery.

ENTERIC FEVER.

The number of cases of enteric occurring in the borough during 1910-11 was more than double that for the previous year. The increase was fairly general all over the borough. There were in two families three cases, in another two cases, and in another there was one instance of three cases in a family and another of two cases. These occurrences would seem to point to the need for more stringent measures of isolation than can be obtained in most of the small houses in Durban. It is therefore imperative that every person suffering from enteric should be isolated from all others except those in attendance on the patient.

In considering the increase it should be borne in mind that the greater part arose in the area to which most of our season's visitors flock for accommodation, and that many of these visitors are only just convalescent from disease. It is certain that some of them have just recovered from enteric, and some may not be free from infection.

TUBERCULOSIS.

Dr. Adams on his arrival took over the duties connected with tuberculosis, and the Tuberculosis Bureau commenced its operations at the beginning of May, 1911.

In some of my previous reports attention was drawn to the fact that although consumption of the lungs was an infectious disease, the ordinary methods of dealing with infectious diseases were not reasonably applicable in cases of tuberculosis.

It is common knowledge that dirty and insanitary houses and impure air predispose to the spread of all communicable diseases. Although great sanitary improvements have been effected in Durban in connection with such conditions, and have produced excellent results as regards many other infectious diseases, the yearly statistics relating to consumption clearly show that sanitary improvements have not produced any practical diminution.

Tuberculosis generally makes its appearance amongst the occupants of houses where the minimum sanitary conditions obtain, and particularly where overcrowding and deficient ventilation exists, still numerous examples can be recorded in Durban where this disease has invaded homes where, in addition to the highest comfort, the very best hygienic and sanitary conditions were maintained.

The European portion of the community has already taken advantage of the services of the Tuberculosis Medical Officer. The coloured races, however, have not come to the Bureau in anything like the numbers anticipated, from statistics of consumption amongst these races spread over many years. This apparent unwilling or reluctant attitude on their part may be as yet due to lack of knowledge or appreciation of the existence or purpose of the Tuberculosis Bureau. Up to the present the great majority of the Indians who have sought advice belong to the more intelligent and better class members of that race.

The leaders of opinion amongst the Indian community are now beginning to awaken to a knowledge of the fact that the Tuberculosis Bureau exists for the purpose of preventing the spread of a dangerous infection amongst their compatriots, and also to assist in the cure of those already attacked. A large and influential committee has been formed by them to assist Dr. Adams in his work, and by the aid of this body of volunteers it is hoped to overcome any objections or apathy on the part of Indians.

Since the inauguration of the Bureau a regrettable, although very pathetic, feature has occurred, viz., the immigration to Durban of many persons suffering from this disease. Some of these sufferers, it was found, had taken the journey on the recommendations of their medical attendants.

DURBAN MUNICIPAL TUBERCULOSIS BUREAU.

From the opening of the Bureau to the end of the municipal year, July 31, 1911 (three months), 302 persons presented themselves for examination.

Many of these tubercular cases attended on more than one occasion, 152 attendances of these old cases being recorded. In addition the medical superintendent paid 115 visits to them in their homes, the bureau nurse 247 visits (in two months, as she undertook her duties on June 1), and the Indian Health Visitor 61 visits (in one month, as he was appointed on July 1). The nurse visits European and coloured patients, while the Indian visits Asiatics and Natives.

Of the 115 cases who attended the bureau, 6 European, 3 coloured, 2 Indian, and 0 native cases died, and a number have left the borough, while the remainder are under supervision.

No medicines are given away as at some of the tuberculosis dispensaries at home, but to a few tubercular cases only prescriptions were given. The majority of the patients who attended regularly gained weight, and improved in health on the advice given. Many persons attended in whom no signs of tuberculosis could be found, whose sputum was examined with a negative result, and who did not react to von Pirquet's test. No non-tubercular patients were allowed to attend after a negative diagnosis had been made.

The social status of the large majority of European cases of tuberculosis is very much higher than that obtaining at the dispensaries in England, and a large proportion of cases found to be suffering from consumption are well able to work and are actually working. A large number came from the surrounding area—Mayville, Overport, Umgeni, Sea View, South Coast Junction, while many visitors to the town from Johannesburg, Harrismith, Volksrust, &c., have consulted the medical superintendent. Among this number have been found a large proportion of cases of pulmonary tuberculosis.

The medical superintendent has notified to the medical officer of health 59 cases of pulmonary tuberculosis who had not previously been notified by the medical practitioners.

Owing to the work of visitation carried out by the nurse, Indian health visitor, and medical superintendent, it has been possible to keep in touch with practically all the cases of pulmonary tuberculosis, in spite of the fact that the Indian popnlation in particular are frequently moving their residences. The department of the medical officer of health has been kept informed of any changes of residence, and any departures from the borough, and a large number of rooms with linen, clothing, &c., have been disinfected when vacated by patients.

The tuberculosis bureau has already got into touch with a large number of persons suffering from pulmonary tuberculosis, in spite of the short time since its opening, and the fact that only for the last month it has had its full staff.

Durban is the first municipality to establish a bureau in South Africa, or, indeed, in the British possessions; consequently it should be a model scheme, and it is hoped that before long the necessary sanatorium and hospital will be forthcoming.

These need not be expensive structures, nor to accommodate large numbers, but it would be satisfactory to provide the required accommodation for those cases who need it, and thus amplify the working of the borough.

BASIL ADAMS, M.D.
Tuberculosis Medical Officer.

Colonial Medical Reports.—No. 40.—Lahore Municipality.

HEALTH OFFICER'S REPORT FOR YEAR 1911.

By Dr. A. G. NEWELL.

Health Officer.

THE year under report was characterized by a deficient rainfall. During the whole year the total rainfall amounted to only 15·57 in., of which 4·01 in. was in the month of March, which month had the greatest rainfall. This too was unusual. We have to go back to March, 1904, to find the same unusual rainfall in this month, when there was a fall of 5·37 in.

The months of May, June and July were characterized by excessive mean maximum temperatures and there is no year during the last twelve years which shows these three months in succession having such high temperatures. In addition to this the month of August also had an abnormally high mean maximum temperature, and during the last twelve years 1911 alone records such a high mean for this month.

VITAL STATISTICS.

Population.—The population of Lahore, as estimated by the census of 1911, is as follows:—

Lahore City	120,436
Civil Station and Anarkali	68,321
Garhi Shahoo, Thathi Mehteran, Killa Gujar Singh, Khui Miran	11,579
Railway Colony	7,790
Total	208,126

The total number of deaths from all causes during 1911 was 6,681 and this, on the above estimated population, gives an annual death-rate of 32·0 per 1,000. The annual death-rate for 1910 was 35·3 per 1,000 and the average for the five years 1906—1910 was 48·4 per 1,000. This shows in comparison with last year a difference of 3·3 per 1,000 in favour of the year under report and, in comparison with the five years' average, a difference of 16·0.

The total infantile deaths (deaths under 1 year of age) for 1911 amounted to 2,226, giving a death-rate of 288·1 per 1,000 births, against 222·3 per 1,000 births for 1910. If we deduct the deaths of infants from small-pox this gives an infantile death-rate of 151·5 per 1,000 births.

BIRTHS.

During the year there were 7,729 births registered as compared with 7,520 for 1910, showing an increase of 209. This gives a rate of 37·1 per 1,000 of the population against a ratio of 40·2 per 1,000 for 1910.

A midwife was appointed on May 10, 1910, and a *dai* was appointed on April 6.

One thousand leaflets, informing the public in the native city about the midwife and *dai* being available for free attendance on maternity cases, were distributed in the city. The total number of cases attended from May 9 to December 31, 1910, were 166, and for the year under report 171 cases were attended.

INFECTIOUS DISEASES.

Plague.—There were 39 cases of plague in 1911, with 19 deaths. Of these cases 32 were imported, 6 were indigenous. This is against 466 cases with 271 deaths in 1910.

The chief measures against plague carried out were: (1) increased attention to removal of rubbish; (2) continuance of rat-trapping during the period of likely incidence of the disease; (3) the use of pesterine and cyllin to disinfect affected houses. Our chief cause of exemption from a plague epidemic I attribute to the rat-trapping operations carried out. The total number of rats caught was 39,776 during four months.

The chief point in the system of rat-trapping is proper supervision of the gang of trappers. Two superintendents proved unsatisfactory and another superintendent is now under observation.

Our cases have been of the bubonic type and the mode of infection is by the agency of the rat-flea. Pneumonic plague, as has been proved by the recent experience in Manchuria, can prove extremely fatal and epidemic. As the bacilli are in the lungs it is not surprising that aerial infection plays the chief mode of spread. It is possible for the bubonic form of plague to terminate in a pneumonic variety, and it is indeed an open question whether all varieties of plague do not terminate in pneumonia, and the reason why such cases do not give rise to other such cases in the same house may be explainable on the ground that the patient in the majority of cases is at death's door before the pneumonia has gained ground, that the bacilli are not of sufficient virulence to fight against other bacilli in the lungs or in the air, and because the majority of corpses are within a few hours hurried off to the burial ground. With the danger that bubonic plague may terminate in pneumonia would seem the necessity for segregation of cases and disinfection of infected houses. Whilst primary pneumonic plague is highly infectious there is evidence, however, that the secondary pneumonia following on plague is not so.

Cholera.—During the year there were 6 cases of cholera with 6 deaths. The first case was reported on August 27 and the last on October 19. During this period there were 7 suspicious cases which were evidently cases of food poisoning. During this period there were 11 cases of diarrhœa. The houses of the

cases were all visited and disinfected as well as disinfection of clothes. Most of the cases were at Gowalmandi, and a special raid was made by me on this quarter by a large staff of sweepers and *bhishtis* and the whole place specially conserved and drains washed, compounds cleaned and all refuse removed. Disinfection of houses and disinfection of wells were carried out and all suspected latrines disinfected. An extra gang of sweepers were sanctioned as well as a special *jemadar* and the erection of an incinerator. The cases at Gowalmandi were around the highly insanitary land occupied by a large number of *gowalas* with their cattle.

Small-pox.—A small-pox epidemic has visited Lahore every three years, and the year following the outbreak had usually also a number of deaths from the disease. The year 1909, however, shows no cases so recorded and I cannot believe that this year was really free from any case. Judging from the system of death registration in vogue and the absence of inquiry into the causes of deaths it is more likely that cases were not recorded from the disease and that cases were concealed; seeing that primary vaccination is also not as successful as it should be and revaccination has not been resorted to supports this contention. There were only 257 revaccinations performed in 1908-9. In 1909-10 there were no revaccinations performed. It is most important for the public to recognize that the mere operation of vaccination cannot be regarded as successful if there has been no evidence left of the operation, and because a vaccination does not "take" it does not mean that that person is immune to vaccination.

Vaccination.

This is the *only* preventive measure against small-pox and since the Health Officer is concerned with all preventive measures against any disease the anomaly of the Health Officer of Lahore not being in charge of vaccination has already been pointed out.

From September 1 to December 31, 1911, 2,574 notices were issued for the primary vaccination of infants. Of these 1,564 had been complied with up to December 31.

There were 3 deaths among 27 vaccinated cases over ten years, or a percentage death-rate of 11·1; also of the 66 unvaccinated over ten years there were 28 deaths, or a percentage death-rate of 42·4. From this we find the advantage of the vaccinated over the unvaccinated as regards escape from death when attacked by small-pox was 73·9.

Many children were primarily vaccinated during the epidemic rather late after exposure to the infection. They, of course, got small-pox, though the vaccination in some modified the disease. The following case is interesting in this respect: A child had three recent marks of vaccination on the left arm. The top one was still in its scabby condition when I saw it. The certificate of vaccination showed that the vaccination was performed on December 17, and the child was attacked on December 26 with small-pox, the rash appearing as usual on the third day (28th). Thus whilst primary vaccination, performed on one incubating the disease, nine days before the symptoms presented themselves, did not prevent the development of the disease, it was successful in modifying the disease and saving the child's life, as the child had only a very discrete form of the disease. Many other instances of such late resort to vaccination could be cited.

I attribute the present epidemic to the following chief facts: (1) To the ignorance of the people leading them to conceal cases; (2) to the worship of the goddess of small-pox; (3) to the fact that the people have not resorted generally to revaccination; (4) to the failure of a large number of primary vaccinations.

Whilst it is true that the small-pox virus can strike at great distances—and in a congested city like that of Lahore it has an easy action in this respect—yet we must remember that this is only possible when the community is susceptible—*i.e.*, unprotected by vaccination. As regards the first of the above reasons, it is unfortunate that through ignorance the lowest classes do not know that they should report cases and that such reporting does not incur any risk to them. Inquiry elicited that there had been cases of small-pox in the city before I got information of the first case, and later in my rounds many cases were discovered which were never reported simply because the people really did not know. It is true ignorance of the law is no excuse, yet how can one prosecute such ignorant people, who can neither write nor read and who are dependent on their news and their duties to custom and law, or what perhaps their neighbours say? Again, through this same ignorance the majority of the cases in December were only known from the notification of the death. Is it then to be wondered that with so many cases in existence the disease spread as it did? Lastly, in going through the city many children were found with recent marks of small-pox, and on questioning them and taking down their names and addresses it was found that many had been unreported. As regards the second reason, I have tried to find out what is the actual religious view concerning this disease. I have not been satisfied to the extent I wished, but so far I have learnt (I give my information for what it may be worth) that (*a*) about the eighth to tenth day of the disease a certain amount of religious ceremony is observed with friends; (*b*) that an affected person should not be exposed to the air or public view and so the patient is kept in the dark; (*c*) that no vaccination should be performed in the same room as the case; (*d*) that no one with dark clothes should enter the room; (*e*) that by some it is regarded as inadvisable for the Health Officer to see the case. If these views are correct, and there are probably others, it is clear that one's action is to a great extent limited. As regards the third cause, it is to be regretted that revaccination has been in such a deplorable state. To some extent this is to be attributed to ignorance of the fact that revaccination is as necessary to protect against small-pox as primary vaccination. Though I am glad to record the fact that the various notices issued with a view to emphasize this fact has resulted in a resort to revaccination by those willing to act on such advice, yet I do not hesitate to state that, in my opinion, the time has come when a law for the compulsory revaccination of all children at 9 years of age should be enacted. This point is one in which my

committee should move Government, and by it alone can unnecessary epidemics of small-pox and loss of life be avoided. Further, all Government clerks, &c., should only be employed as are *revaccinated*, as attacks of this disease cause unnecessary absences from work from an avoidable disease. With reference to the fourth cause it was clearly demonstrated to me that a very large number of children had not been primarily vaccinated, and the result of this is clearly shown where children under 10 years of age formed the greater number to be affected and to die therefrom. This is highly to be regretted from an economic point of view. Many children were stated to have been vaccinated in infancy and yet showed no marks. Granted that the truth was not told in many cases I have no hesitation in stating that the manner in which this was said convinced me that these simple people told the simple truth. Others again likewise impressed me of the truth of their statement that the vaccination had been performed but had not taken. To what can we attribute this insufficient primary vaccination and its failures? To the former part of this question I am of the opinion it is due to (*a*) that vaccinators in the past have not been doing their duty; (*b*) that a certain number of people have not resorted to primary vaccination; (*c*) that a certain amount of bribery to escape vaccination has probably existed; (*d*) that to a slight extent people mistake plague inoculation and vaccination; and (*e*) that there is a belief that the *sahib* vaccinates with one sort of lymph and the Indian vaccinator with another. I cannot help remarking on this last because it has actually been told me, also because in my own visits to do house-to-house vaccination I have not had the slightest difficulty in getting vaccinations done so far as primary vaccinations are concerned. Indeed one child actually cried to get done, although she had been successfully vaccinated and revaccinated. The only instance in which primary vaccination was refused was that of a child who had recently lost its mother. The aunt who was looking after this child would not have the child vaccinated because she herself, poor woman, had recently lost a child of her own. Although I promised to supply good milk for the child for two months from the best dairy in Lahore this woman said she was prepared to die rather than have the child vaccinated. This case, however, must be regarded as exceptional and as due to a mixture of ignorance and grief from her recent trouble. As regards revaccination there is not opposition against it but rather a simple belief that it is not necessary.

We have been painfully aware of the ravages of this disease among the inhabitants of the city. Anyone who has studied the death returns would think that tuberculosis is a new disease for the city. This cannot be so. It is only because an endeavour has been made to find out the causes of death that the number of tuberculosis cases have mounted up. Personal observation in the city has shown me that there were many cases of phthisis. I do not say we have reached absolute accuracy in this respect—that is impossible by the present system of death registration and the absence of reliable investigators. This disease and others can only be put upon a more satisfactory statistical basis by getting rid of the present illiterate *moharrirs* and substituting for them some hospital assistants who have received some medical education.

There are two types of the tubercle bacilli, viz., (1) human, (2) bovine. Both these types produce tuberculosis in man. Thus the sputa of a phthisical case is infectious to man. On its being dried the bacilli are conveyed through the medium of the air, *i.e.*, it is inhaled. The conditions of ill-ventilated and ill-lighted rooms, together with the moisture from other immates in the room, are sufficient to afford an excellent medium for propagation. The bovine type causes tuberculosis to bovines, swine and to a lesser degree to children and young adults. The danger here lies through the ingestion of infected cow's meat, milk and butter. The meat supply is under supervision and the danger of this is lessened. To the milk supply we must ascribe a more important source of danger. In the absence of a laboratory, however, we cannot be certain to what actual extent this danger does exist in the Lahore milk supply. One thing, however, is certain, that the tubercle bacillus can develop and pass through the excreta of a cow even though that cow be not affected with tuberculosis. This cowdung, therefore, is a matter for consideration. I am rather of the opinion that more tuberculosis is spread in India through cowdung and cowdung cakes than through the medium of meat or milk. This may appear at first a rather startling statement to make, but our veterinary examinations have shown that tuberculosis both in cows and buffaloes is a rare disease. As my experience may not be regarded as sufficient—though I could not overlook what has been my personal observation—I wrote round to the many veterinary authorities in India to get their opinion on this point and found it supported my own conclusions.

The milk may be a cause, but the milk is extremely liable in its process of drawing from the teats, by the dust in the cowshed, by the brushing of the sides of the animal by the milker, and by its environment in an atmosphere of cowdung particles to be infected with the tubercle bacillus from cowdung. The other reason why cowdung should be a greater cause than the milk is that most Indians use heated milk, and curdled milk is a common drink. Thus in a crowded city like Lahore "city" where cattle are too numerously present in many insanitary places, where cowdung cakes are permitted to be attached to any wall, and where the light of the sun only enters for a few hours or not at all, it is not, indeed, to be wondered if a very large number of the people are tuberculous. As it is a chronic disease and one in which the actual death-rate does not represent its actual prevalence, it may be taken from me that it is far more prevalent than our death-rates from phthisis actually represent.

Tuberculin Treatment.

This can be used (1) as a preventive, (2) as a cure. It is with the former I am concerned chiefly, and it is undersirable, in my opinion, to confuse its use for these two purposes in the hands of one person or in one institution. Further, success for the preventive purpose is only attainable by attention to many

important factors to which the physician at a dispensary could have no time to attend to or inquire into. Few people will go to a tuberculin dispensary situated at any distance from the city, and what is wanted is the allocation of funds for the Health Officer to use "tuberculin" in such cases as he can after inquiries from his death returns on people in such infected houses, and to give it to such physicians who will furnish him with the returns necessary. Lastly, I cannot but add that skill and intelligence in its use are important factors in success. At the same time, we must remember, in India it will be an experiment, and so the time is not ripe for any large provincial dispensary which is likely to be a costly failure.

Considering our returns we find there have been 571 cases of phthisis during the year, of which 386 were among Mohammedans and 185 among Hindus. Ward III gave the largest number of deaths, viz., 73, and next to it come wards II and IV, which gave 53 and 46 deaths respectively. As was to be expected, most of the deaths were recorded in September, October, November and December—months when the humidity rises and chances of chill are greater. When we consider the age periods at which these phthisis deaths occur we find that no less than 284 of the 571 occurred between the ages of 15 and 35 years, and of these 161 between 15 and 24 years, *i.e.*, at ages of the early bloom of manhood at which ages a community can least afford its death-rate.

Irrigation.

There can be little doubt that irrigation, as it is practised in Lahore, must be regarded as an important factor in the prevalence of mosquitoes. As Lahore becomes more closely related to Lahore Cantonments by the extension of buildings the danger, some day, is likely to be more real than it is at present, since the latter place has long been known to be malarious, and we shall then have the varieties of anopheles, there prevalent, invading us. There is too much over-irrigation in the Civil Station due to the absence of any definite regulated system and to the *kutcha* channels. Most places are flooded rather than irrigated. A system of payment by volume would lessen the evil and would necessitate a regulated system. For this purpose, therefore, it is to be regretted the irrigation module is not introduced. Yearly, too, some money might be spent on the provision of *pucca inverts* to the main irrigation channels.

Water Supply.

During the year a special note on the water supply was submitted by me. The purification of our supply on a simple and not costly method of mechanical filtration, as by the Paterson filter, will give us the requisite purification we want. A laboratory is necessary to prove the quality of water from time to time and test the guarantee of efficiency of the filter. I consider the purification of our water supply outstands in importance any other scheme.

Quinine Distribution.

Quinine was again this year distributed among the poor of the city. In all 106,400 tablets or 5,320 tubes of quinine were distributed. This year the system was introduced of giving out tubes each containing 20 tablets of 4 grains each or sufficient for the treatment of a case of malaria. With each tube was given a leaflet of instructions in the vernacular of how to use quinine for an adult or a child both for prevention and the treatment of malaria. The people come readily for the quinine.

General.

From the report it will be seen that but for small-pox the year has been a healthy one. The only thing that will save us from a small-pox epidemic and its results in future is a revaccination law. The death-rate in comparison with past years and the averages for past years tells its own tale of the improved sanitary condition of the city and environments. The city is now cleaner than it has ever been.

Table of Meteorological Data for Lahore for 1911.

	Temperature		Relative humidity at 8 a.m.	Rainfall
	Mean Maximum	Mean Minimum		
January	65·9	48·3	89	2·56
February	74·1	47·0	76	0·17
March	76·2	54·7	79	4·01
April	93·6	64·2	50	0·38
May	107·1	74·2	37	0·58
June	106·3	81·8	55	2·10
July	106·8	83·1	58	1·14
August	104·6	83·9	58	3·50
September	98·9	77·7	71	0·90
October	96·5	64·3	61	0·27
November	76·8	48·5	79	0·60
December	72·0	40·3	81	0·00
				15·57

Colonial Medical Reports.—No. 41.—Colony of Mauritius.

REPORT ON THE MEDICAL AND HEALTH DEPARTMENT FOR 1911.

By R. DENMAN.

Director, Medical and Health Department.

Statistics of Population.

The civil population on December 31, 1911, as estimated by the Registrar-General and based upon the Census returns for 1911, with a total of 372,274, shows that the estimate for last year was too high. This error extends also to the birth and death-rates given for 1910. Therefore comparison between the two years is not possible.

The number of deaths was 12,204 against 12,485 in 1910 and 13,761 in 1909. The whole of this reduction is more than accounted for by the fewer number of deaths from plague in 1911. The deaths for the two years, subtracting those from plague, were as follows: 1910—11,935; 1911—12,173.

The death-rate was 33 per cent., that for the decennial period 1901-1910 being 37·1 per cent. As I have stated above this latter figure is not reliable owing to the error made in calculating the total population. As regards districts, Port Louis, as usual, gives the highest, 43 per cent., followed by Black River 38·8, Grand Port 36·6, Flacq 34·6, and Pamplemousses 33·0. Plaines Wilhems is lowest with a still too high rate of 25·8 per cent.

14,584 children were born during the year, giving a birth-rate of 39·4 per cent., or nearly 4 per cent. above the decennial average. Rivière du Rempart again heads the list this year with a birth-rate of 43·9 per cent. Pamplemousses is lowest with 36·1 per cent.

The disease that caused most deaths was malaria—4,313 deaths being attributed to this disease alone, *i.e.*, more than one-third of the total. This figure is not reliable; "la fièvre" is a common and easy diagnosis, and is the cause of death usually given when the registration is made by the friends of the deceased and without a certificate from a medical man. The next highest is pneumonia with 1,186, tuberculosis 836, and debility (ankylostomiasis?) 802. Adding the deaths caused by these diseases and subtracting their sum from the total deaths, we find that 58·5 per cent. of the people who die in Mauritius die from diseases that are now looked upon as preventible ones, and that with proper sanitary precautions it should be possible to reduce the death-rate of the Island considerably. As I have said above, the figures for malaria are not reliable, but considering the weakening of resisting power caused by repeated attacks of malaria, we may take it as certain that though many of the deaths recorded as due to malaria were not immediately due to that disease, the possibility is that they would not have occurred if the patient had not been weakened previously by several attacks of fever during his life.

Meteorological Statistics.

According to the Director of the Observatory, the year was characterized by an unusually low average temperature. The years compare thus:—

	Solar max.	Grass min.	Shade max.	Shade min.	Rain
1910 ...	168·4 ...	45·1 ...	90·2 ...	53·61 ...	38·79
1911 ...	150·6 ...	54·1 ...	87·5 ...	61·8 ...	46·28

Twenty-five inches of rain fell in February and March. The last six months only had 6·56 in. between them. These are the figures for the Observatory, but the drought of the last six months was equally felt all over the Island. According to the hospital returns (the only reliable ones) the malaria curve followed the rain curve, most fever cases occurring in the hot months and the fewest in the dry cool ones—July, August, and September.

Prevalence of Sickness and Recurrence of Particular Diseases.

The usual returns are taken as the basis for this report. The number of patients admitted to the various hospitals and asylums in 1911 was 18,074 compared with 18,128 in 1910. 6,783 were treated as out-patients at these institutions, and 62,384 attended the dispensaries.

Malaria and Hypertrophy of the Spleen.—2,117 cases were treated in the hospitals with a death-rate of 0·89 per cent., an increase of 0·01 per cent. over last year. Splenic hypertrophy fell still further from 561 to 380, showing that malaria is on the decrease.

Dysentery.—566 cases with a mortality of 12·54 per cent.; a slight decrease in the number and death-rate of 1910, when the figures were 575 and 13·9 per cent. respectively.

Enteric Fever.—53 cases were treated in the various hospitals against 48 in 1910 and 77 in 1909. The death-rate was 22·6 per cent. The total number of cases notified in the Colony, including the above, was 182, with a case-mortality of 18·1 per cent. The diagnoses in most, if not all, of these cases were verified by Widal's reaction.

Diphtheria.—10 cases were admitted to the hospitals with 4 deaths. There were 28 cases in all with a mortality of 25 per cent.

Influenza.—1,610 cases, 300 less than last year, were admitted.

Pneumonia.—598 cases were admitted to the hospitals during the year with a mortality of 24·5 per cent. As I have stated above 1,186 deaths occurred from this disease alone. It was very prevalent among the estate coolies, especially towards the end of the year. As the disease took on a quasi-epidemic form I was at one time inclined to suspect plague. Careful examination of the sputum showed absence of the plague bacillus and proved that they were cases of ordinary pneumonia.

Tuberculosis.— This disease appears to be on the increase and demands more attention. 954 people were admitted to the hospitals with it and its prevalence is shown by the fact that 836 deaths were due to it alone. It was stated to be the cause of death in one case out of every fifteen.

Cerebrospinal Meningitis.—No cases were admitted to the hospitals during the year, but there were 9 deaths in the Island from this disease against 7 in 1910.

Beriberi.—Eleven cases with 3 deaths were under treatment during the year. Some cases of "epidemic dropsy" resembling beriberi were reported: they were limited to one family.

Nephritis.—The increase in the number of admissions for this disease was maintained. The figures for 1910 and 1911 were 576 and 631 respectively.

Syphilis.—It is regrettable to be obliged to report a still further increase in this disease, no fewer than 767 persons having presented themselves at the hospitals for treatment as in-patients and 9 as out-patients, whilst 768 were treated at the various dispensaries. In 1904 the cases treated at the hospitals were only 352 out of an estimated population of 378,745, whilst this year, with a population of 372,274, the number has risen to 767.

Leprosy.—No cases were treated at the hospitals during the year. One hundred and fifty-six people were treated at St. Lazare. Of these 82 belong to the general population and 74 are Indians. Thirty-six were discharged and 25 died, leaving 95 in the asylum at the end of the year. This does not represent anything like the number of lepers in the Colony, and until some method for the registration of lepers be adopted all reports on the disease must be confined to those patients treated at the St. Lazare Asylum. I am indebted to the Poor Law Commissioner, in whose charge the asylum is, for the figures given above.

Erysipelas.—53 cases of this disease were notified during the year; a reduction of 20, the number notified in 1910 being 73.

Measles and Scarlet Fever.—2 cases of each of these diseases were notified during 1911.

Mental Diseases.—133 cases were admitted to the Beau Bassin Lunatic Asylum during 1911; 77 of these were new cases and 56 re-admissions. The total number of inmates on December 31, 1911, were 456, being 40 in excess of those in the wards on the same date in 1910. The daily average amounted to 430·9.

There were 25 criminal lunatics, viz., 21 males and 4 females, 3 more than during the previous year. In only 70 of the admitted cases could the absolute cause of the mental trouble be diagnosed. In all cases the old sources were found, ganjah smoking and heredity being the two most common ones.

Seventy-one patients were discharged, the percentage of cures being 45·8 to the admissions and 14·4 to the daily average, both figures being considerably lower than in 1910. There are altogether confined and on probation 660 certified lunatics in Mauritius, viz., 406 males and 254 females. The ratio to the total population is 1 to 564, the insane rate of the total population being 3·03 per 1,000. The Indians, as usual, have a lower rate, viz., 1·21 per 1,000.

Plague.—124 cases were treated in the general hospitals and 36 in the lazarets against 77 and 243 in 1910. The end of the 1910-1911 outbreak was severe and abrupt, 86 cases occurring in January, 1911, 22 in February, 5 in March, and 6 in April, the last case being declared on the 20th. The next cases reported were in June (two), and then one on August 27, but the 1911-1912 outbreak was delayed really until the end of September, when isolated cases began to crop up, and up to December 31 only 51 more cases were reported, making the total for the twelve months 173. Of these 131 died, giving a death-rate of 75·7.

A short and sharp outbreak attacking 19 people and killing 13 appeared in the town of Rose Hill in November. The first patient came from Port Louis and was declared on the 18th. Owing to insanitary surroundings the disease spread rapidly and it was decided to evacuate and demolish the block of buildings infected. This was done with the result that the last case was declared on December 11, and Rose Hill has been free from plague up to this.

Out of the 173 cases 36 were on sugar estates.

Race Incidence has increased among the white population from 1·18 to 2·3, the non-white from 29·1 to 29·5, and amongst the Chinese from 2·7 to 11·0. It has decreased among the Indians from 66·3 to 57·2.

Age Incidence.—As usual the younger portion of the community suffered most. Sixty-seven per cent. of the attacks occurred in those under 30. This constant drain on the reproducing part of the population probably accounts in some measure for the decrease in the total population shown in the last Census. As regards sex the percentage of attacks was, amongst males 66·5 and females 33·5 per cent., the death-rates, however, being reversed, viz., males 72·2 and females 82·8. per cent.

As regards type, bubonic was the commonest and femoral buboes were the most numerous and least fatal. Other types, viz., abubonic, pneumonic and septicæmic, existed in 18 instances and were fatal in every case.

One thousand six hundred and seventy-three premises, containing 25,226 rooms, were disinfected in Port Louis during the year, leading to the discovery of 1,195 dead rats and mice, and the bodies of 32 cats and 70,692 rodents were destroyed during the year—only 60 of these were brought in by private parties.

In the country districts 23,258 rodents were destroyed by our rat-catchers and 2,590 were brought into the police station at Rose Hill. 21,485 of these animals were examined for plague bacilli, representing

36·7 per cent of those caught in Port Louis. The percentage of infection was 0·66.

The Grand River N.W. Lazaret was used for 36 patients during the year, the only other lazaret used being the one at Poudre d'Or. Subtracting those cases that were admitted in a moribund state the death-rate at this lazaret works out at 32 per cent. The estate hospitals come next with 59 per cent., private cases 70·6, and the Civil Hospital 73·5, the high figures in the last two items being because most of the private cases are notified after death and those that go to the Civil Hospital go there in a dying condition.

Surra.—51 animals are reported to have died from surra during the year, the figures for the last five years being :—

1907	1908	1909	1910	1911
306	192	158	50	51

The reduction probably means that most of the susceptible animals have been inoculated, had the disease, have recovered from it and are now immune.

The year under consideration has been noticeable chiefly for the decrease in the number of plague cases. Excluding this one disease, as I have pointed out elsewhere, the total number of deaths is higher than that of 1910. Malaria is distinctly on the decrease, but many other communicable diseases are increasing—notably tubercle and syphilis. Pneumonia with 1,186 deaths is largely responsible for the high total. The number of inmates of the Leper Asylum is diminishing, but I do not think that this disease is disappearing. Means for registering existing cases are necessary and more perfect supervision is required. Lunacy, especially among the non-white general population, is more common than it should be. The cause I attribute to poverty, drink, ganjah and heredity.

Vaccination.

Eleven thousand two hundred and ninety children were vaccinated in 1911, an increase of 878 over 1910. Of these 11,090 vaccinations were successful, 68 were unsuccessful, and the rest were lost sight of. The proportion of successes to failures was 98·2 per cent. and the proportion of children vaccinated to those born was 77 per cent., a comparatively small proportion when we come to consider that this is our only protection against small-pox and that compulsory re-vaccination is not enforced.

Colonial Medical Reports.—No. 42.—Municipality of Colombo.

MEDICAL REPORT FOR 1911.

By W. MARSHALL PHILIP.

Medical Officer of Health.

1.—Introduction.

The mean temperature of the air during the year 1911 was much the same as the average; but there was, for the ninth year in succession, a great shortage of rain recorded, amounting to 24·06 in.

The most noteworthy event of the year was the taking of the Decennial Census upon the night of March 10, 1911, when a population of 212,295 was disclosed, representing the remarkable intercensual increase of 36·02 per cent. This great increase has had a most important bearing upon the health of the town.

The birth-rate during 1911 was higher than the average, but owing to the large number of children of Colombo parents who are born and registered in districts outside the town, the birth-rate as recorded does not afford a true measure of the fertility of the population, which is undoubtedly great in the case of the Burghers and the Sinhalese.

The general death-rate during 1911 was rather above the average, owing to an increased mortality amongst Malays, Sinhalese, Burghers, and Tamils. There was, on the other hand, a reduction in the mortality amongst Europeans, "Others," and Moors.

The increase in the death-rate was confined to two wards, viz., St. Paul's and San Sebastian, all the other wards having a lower rate than the average. Amongst the principal causes of death, pneumonia and enteric were the only ones which showed an increase; but in the case of enteric, the apparent increase was more than counterbalanced by the decrease in the number of deaths ascribed to simple continued and remittent fever, both of which terms are being to a large extent abandoned by the medical profession, who now, as the result of improved methods of diagnosis, prefer to apply the more specific term of enteric fever. The only exception to this is in the case of the Malays, a large proportion of whose deaths from fevers continue to be returned under the unscientific headings of simple continued and remittent fever. There appears to be little doubt that, although the Malays have apparently one of the lowest death-rates from enteric, they in reality suffer more from this disease than any other race except

the Europeans. The steadily increasing and now very high mortality from pneumonia is a serious matter, more especially as it is a difficult disease to deal with. Its increased prevalence is probably associated in some measure with the climatic conditions which have prevailed.

The mortality from phthisis has shown a noteworthy improvement during the last two years, which is very encouraging in regard to the preventive measures which have been adopted during that period.

The infant mortality, which has been improving so steadily for a series of years, was higher than the record low rate of 1910, but was still 22 per 1,000 below the average. The defect in the registration of births referred to above has the effect of making the infant death-rate here appear higher than it probably is in reality.

There was a considerable increase in the number of infectious diseases notified and dealt with during 1911 compared with the previous year, which was in a large measure due to phthisis having been made a compulsorily notifiable disease, and to an improvement in the diagnosis and notification of enteric fever. There were nineteen cases of cholera and thirty-six of small-pox reported from the town during the year, the original infection of each disease having been imported, as usual, from India, *via* the Ragama camp in the case of the cholera and *via* Tondi in the case of the small-pox.

The housing problem in Colombo has become very acute, both as regards the insufficiency of accommodation and as regards the existence of unhealthy areas and unhealthy dwellings, and it is urgently necessary that something should be done to improve matters.

The question of the purity of the food supply in Colombo is one which has long been crying for better attention, and it is recommended that the Council should give this matter immediate consideration. Proper food laws are much required.

The admittedly poor quality of the bread in Colombo is said to be due to the use of inferior flour, and the bakers assert that their customers will not pay the price which the use of Trieste flour renders necessary. The question of improving the quality of the tinned foods imported into the Island requires attention.

There has been quite a remarkable improvement in the matter of milk adulteration during the last few years as the result of the action taken by the Public Health Department, the percentage of adulterated samples having dropped from 73 per cent. of the samples examined in 1907 to 17 per cent. of those examined in 1911.

The question of improving the quality of the town water by filtration before distribution has been under consideration for some time, and the installation of the Jewell system has been recommended. The polluted state of the wells in Colombo, particularly the large public bathing wells, is a matter which, although important, cannot be properly dealt with until there is a sufficient supply of town water permanently available to justify closing these wells and substituting town water.

The state of the public markets remains highly unsatisfactory. The dairies have been improved, but are most difficult to maintain in a sanitary condition. The laundry trade is in a most unsatisfactory state.

2.—Meteorology.

The mean temperature for the year was 80·8° F., the average for forty-two years being 80·7° F. The total rainfall for the year was 58·26 in., which is 24·06 in. below the average.

3.—Population.

The extraordinary increase in the population has a most important bearing upon the health of the town, but this is a point which cannot be fully considered until the report of the Superintendent of Census, with its attached data, has been published.

The total number of occupied houses at the time of the 1910 Census was 27,268, which had increased to 38,667 at the time of the recent Census, the largest increases being in St. Paul's, Maradana, and Kollupitiya Wards. It is possible that the system of enumeration of houses differed at the two periods, and that these figures are not really comparable. One point stands out clear, however, and that is that the erection of new houses has not kept pace with the increase of the population, all classes of which are at present keenly feeling the insufficiency of house accommodation.

4.—Births.

During the year 1911 there were 5,280 births registered in Colombo, representing a ratio of 24·7 per 1,000 living, as against the average of 23·1 for the preceding ten years, an increase of 1·6 per 1,000; 623, or 11·8 per cent., of those births were attended by the Municipal midwives.

That the births recorded in Colombo are far short of being a complete statement of the children born of Colombo parents would appear to be beyond all question, for not only is it well known that an ancient custom prevails amongst most of the indigenous races, whereby prospective mothers migrate prior to their confinement to the homes of their parents, which are in many instances situated outside the town, but a comparison of the birth-rates of the several races in Colombo with those of the same races in the Island generally shows that the Colombo rates, as recorded, cannot possibly be accepted as a true measure of the fertility of the Colombo population. The direct effect of the migration referred to is to make the infant death-rate appear much larger than it really is, because a large proportion of these children are brought to Colombo after the mother has sufficiently recovered, and help to swell the unregistered (in Colombo) part of the infant population, and to contribute towards the infant death-rate, which is reckoned upon the population of the infants registered in Colombo only.

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5.—Deaths.

During the year 1911 there were 7,234 deaths (inclusive of deaths of non-residents) registered in Colombo, representing a ratio of 33·8 per 1,000 living, as against the average of 33·0 during the preceding ten years, an increase of 0·8 per 1,000; 631 of these were deaths of non-residents of Colombo who died in the hospitals, the death-rate (exclusive of non-residents) being only 30·9 per 1,000. Further corrected for age and sex constitution the death-rate was 35·5 per 1,000.

Deaths by Races.

The Malays had the highest death-rate during the year, viz., 40·1 per 1,000, next come the Sinhalese (37·1), then the Tamils (33·4), then Moors (29·2), then Europeans (28·3), then Burghers (27·3), and lastly the "Others," who had the unusually low death-rate for them of 27·3 per 1,000. The rates of the Europeans, Tamils, and "Others" are, however, much affected by fluctuations in their populations, and are not therefore very reliable. Comparing these rates with the average of the preceding ten years, it is found that the mortality amongst "Others" was 7·6 per 1,000 below their average, amongst Europeans it was 1·3 below their average, and amongst Moors it was 0·5 below their average. The rates of all the other races were above their average.

It is necessary to bear in mind, when considering these death-rates, that some of them are seriously affected by the deaths in hospitals of non-residents in Colombo.

6.—Infant Mortality.

Deaths, 1,669; death-rate per 1,000 recorded births, 316; average rate for preceding ten years, 338; decrease, 22 per 1,000.

The infant death-rate in Colombo is probably not so high as it appears, for the following reason. It is reckoned as a proportion to the infant population as represented by the number of births registered in Colombo during the year. If, therefore, any of the births escape registration in Colombo during the year, the death-rate will be reckoned on a population smaller than the actual, and will consequently be made to appear higher than it really is. This is actually happening in Colombo, for it is known that it is the custom amongst the indigenous races for women to repair prior to their confinement to the house of their parents, and as many of the Colombo men are married to country women, many of the men themselves hailing from the country originally, it follows that a large number of children of Colombo parents are born and registered in these extra urban districts, their births being thus lost to Colombo; and as such of these children as survive are brought to Colombo, where their subsequent deaths are registered, the effect is to make the infant mortality appear higher than it really is. How far this custom affects the infant death-rate it is impossible, with any certainty, to say; but as a result of a rough estimation, I make it that the infant death-rate, instead of being about 300, is probably nearer 200 per 1,000 births.

The average infant death-rate for each race in 1911 and for each race during the four years 1908-1911, in respect of which records for the individual races are available, has been as follows:—

	European	Burgher	Sinhalese	Tamil	Moor	Malay	"Others"
Average, 1908-1911	159	200	290	436	410	304	441
1911	182	218	286	413	423	291	408

The persistently high infant death-rates amongst the Tamils, Moors, and "Others" demand attention. A large proportion of the Tamils, and many Moors, being poor, are compelled to live in unhealthy areas, such as exist in St. Paul's, New Bazaar, and San Sebastian Wards, their infants being thereby exposed to conditions which are invariably associated with a high rate of mortality. The mothers are, moreover, very ignorant and careless, and, especially in the case of Tamils, have to work instead of attending to their children. The great need in their case is that sanitary dwellings should be provided for them at a rental which they can afford to pay. This will certainly not be done so long as it is left to the property owners to carry out, for, the moment a better-class house or tenement is erected, even in an insanitary area, the rent is raised, and the house is thereby placed beyond their means. In this connection reference is requested to the section dealing with the housing problem.

It is generally admitted that the infant mortality is the best test of the sanitary condition of a district, and the statistics in Colombo fully bear us out, as shown by the following statement, in which the infant death-rate in each ward during 1911 and the average for the preceding ten years are given.

7.—Pulmonary Diseases.

Under this heading are included phthisis, pneumonia, and bronchitis.

Deaths, 1,897; ratio, 8·24; average, 8·11; increase, 0·13 per 1,000.

Phthisis shows a decrease of 0·55 per 1,000, pneumonia an increase of 0·68, while bronchitis was the same as the average.

(*a*) *Phthisis.*

The improvement in the death-rate from phthisis which took place during 1910 was continued during 1911, the number of deaths recorded from this cause being 634, representing a ratio of 2·96 per 1,000, of which no less than 88 or 13·8 per cent. were deaths in hospitals of non-residents of Colombo.

As in previous years, there was in 1911 an extraordinarily high death-rate from phthisis amongst Mohammedan women (Malays and Moors) compared with the rates amongst the males of these races, and, as has previously been pointed out, this is no doubt in a large measure attributable to their peculiarly insanitary custom whereby they keep their women very much confined to their houses, which are often badly lighted and ventilated. In the case of the stricter Moors, the women are further deprived of the benefits of fresh air and sunlight by their insanitary custom of shutting themselves up in closed carriages, or wearing heavy veils or cloths over their heads when

they go out. It is high time that the more intelligent of the Mohammedans turn their attention to this matter. What is required is that their women should have outdoor exercise, with plenty of fresh air and sunlight; they should be taught that phthisis is an infectious disease, and that they should not go and unnecessarily sit or sleep in the same room with a patient suffering from this disease, and that those so suffering should adopt precautions with a view to preventing the spread of infection to others. A female health visitor with a special knowledge of phthisis could, I believe, do much good by teaching these people, amongst whom the feeling of family attachment is strongly developed.

In view of the marked improvement in the mortality from phthisis which has occurred in the last two years, and the fact that the increasing prevalence of this disease in the Island generally has recently been the subject of a Government Commission, it may be of interest to state what are the preventive measures now recognized to be necessary, and how far they have been, or still require to be, adopted in Colombo.

Preventive Measures. — The measures which are now recognized to be necessary for the prevention of phthisis may be divided into the three following more or less distinct groups: (*a*) direct preventive measures, (*b*) indirect preventive measures, (*c*) relief and educational measures.

Direct Preventive Measures. — These include all those which have for their object the prevention of the spread of the virus of the disease from infected to non-infected persons, and comprise such measures as detection, notification, segregation, and disinfection.

Indirect Preventive Measures.—Under this heading come general sanitary measures which have for their object the prevention or removal of conditions which tend to act as predisposing causes of the disease, such as overcrowding, contamination of the atmosphere, defective lighting and ventilation, dampness, &c.; in other words, general sanitary measures. These measures will include such works as drainage, paving, dust prevention, cleansing, prevention of overcrowding, and improvement of unhealthy dwellings and unhealthy areas, including re-housing of the poorer classes displaced during the progress of improvement schemes.

Relief and Educational Measures.—Under this heading come the erection of sanatoria for the treatment of early and, therefore, presumably curable cases, providing suitable employment for those who, although infected, are still capable of doing selected work, organizing and distributing relief to the families of bread winners who are incapacitated for work by the disease, propagating knowledge in regard to the causes, methods of prevention, and cure of the disease by popular lectures, by teaching in schools, and by the distribution of literature on the subject.

Incidence of Control.—The carrying out of the direct and indirect measures enumerated above is an obligation which rests with, and can only be properly discharged by, the authorities armed with legal powers, and with sufficient staff and funds at their disposal.

The organizing and carrying out of relief and educational measures belongs more properly, at least in the earlier stage, to the sphere of action of the voluntary worker and philanthropist, and need not be further considered here.

Preventive Measures adopted in Colombo.—Although phthisis has for many years been a steadily increasing and, indeed, one of the principal causes of sickness and deaths in Colombo, it was not until early in 1906 that this was recognized, as the result of working out and tabulating the rates for a series of years from all the principal causes of deaths.

At that time, however, and for some time subsequently, the attention of the public, and consequently of the Council and its Public Health Department, was much occupied by enteric fever, which, although not nearly such a prevalent disease amongst the population as a whole as phthisis, is much more dramatic in its operations, and strikes, as a rule, the European population more severely than any other race here.

The prevention of phthisis in common with other causes of deaths was, however, not neglected, as this department was constantly engaged in carrying out general sanitary measures, such as checking overcrowding, improving the lighting, ventilation, and drainage of dwellings, teaching the cult of the open window, cleansing of premises, and such like, all of which act as indirect preventive measures.

Here it is necessary to point out that the Council have as yet neither the legal power to enforce segregation of cases, no matter how dangerously infectious they may be, nor, even if they had such power, have they a hospital in which they could isolate them. It is impossible, therefore, for the present to do more than strive to improve the methods now being carried out.

Indirect Preventive Measures. — One has seen it stated that of all zymotic diseases phthisis has shown the least tendency to diminution from general sanitary measures. This is no doubt true as a general statement; but where, as in Colombo at present, practically every principle of sanitation is violated, particularly as regards the insanitary construction and disposition of dwellings, the irrepressible tendency towards overcrowding, the lack of proper means of drainage and disposal of waste, the almost entire absence of measures for the occlusion of damp in a climate with an average rainfall of 82·32 inches per annum, and the ignorance and indifference of the population as regards sanitary measures generally; under such circumstances there can be no doubt that the problem of phthisis prevention in Colombo is intimately associated with, and to a considerable extent dependent upon, the carrying out of the indirect preventive measures enumerated above, and that no scheme for the prevention of this disease which omits to provide for the carrying out of these measures can be considered either complete or likely to be really effective.

Drainage.—Although, as is known, many miles of sewers have been laid, and the whole town will in time be thus served, very few premises have so far been drained (only 97 out of the estimated number of 8,000 to 10,000 available at the end of 1911), and consequently the sanitary condition of the town has not yet appreciably benefited by this great work;

indeed, on the contrary, it has in some respects suffered in consequence of the breaking up of the streets, the blocking of existing open side drains, and such like, all of which are, of course, unavoidable during the construction stage. Needless to say, the benefit of the sewers can be reaped by the town at large only after the connections have been made, and it is therefore most necessary that, as the City Sanitation Engineer has recently pointed out, if the work of connection is to be completed within a reasonable period, the present rate of progress must be very considerably augmented.

Paving and Damp-proofing.—There is no legal power to enforce paving of floors, backyards, or lanes, and progress in this direction has therefore been very difficult; but, as the statement of structural improvements included in each annual report shows, a considerable number of dwellings, backyards, and passages have been paved at the instance of this Department. There is no legal power to require the provision of damp-proof courses, and scarcely a house in Colombo is so protected. Special powers are urgently required in those respects.

Dust Prevention.—The practice of road oiling is now being carried out by the Works Department on a considerable scale, and has very materially reduced the dust nuisance. It is, however, not so effective or so lasting as paving, the initial cost of which, however, is heavy.

Public cleansing includes scavenging and the conservancy of latrines. As regards the scavenging, it has been enormously improved since the contract system was abolished, and the work was taken over departmentally by the Works Department in 1905, the latest and a most important improvement in this connection being the establishment of a Horsfall refuse destructor, with a view to replacing the old and highly insanitary method of tipping.

The conservancy of latrines was taken over on September 1, 1911, from the contractor, in view of the unsatisfactory manner in which the work was being performed by him, and already one sees signs of great improvement; but the bucket system can never, even with the most perfect management, be anything but highly objectionable and insanitary in a town of the size and with a population so careless in these matters as exists in Colombo.

Private Cleansing. — The work of maintaining private premises in a cleanly condition is one in respect of which the householders are held responsible under the Ordinance, and one of the principal tasks of the sanitary inspectors consists in endeavouring to keep them up to the mark.

Careless and obstinate although many of the householders are, an enormous improvement has been effected in the state in which private premises are kept, as anyone who was acquainted with the back compounds of Colombo, say ten years ago, and as they are to-day, must recognize. The records of the works engineer as regards the output of scavenging rubbish are the best evidence on this subject.

Overcrowding.— Midnight inspections, with a view to the detection and prevention of overcrowding, have for years been regularly carried out; but it is a hopeless task so long as there is the present insufficiency of house accommodation. The most that can be done is to get the worst instances abated, and this is as far as possible being done.

(*b*) *Pneumonia.*

Deaths, 859; death-rate, 4·02 per 1,000; average for the preceding ten years, 3·34; increase, 0·68 per 1,000. This death-rate has only twice been exceeded during the decade 1901-1910, viz., in 1908 and 1909.

Forty-six, or 17 per cent., of the deaths from pneumonia in 1911 were of non-residents of Colombo who died in the hospitals. This disease was the principal cause of death amongst the population of Colombo during 1911, being responsible for no less than 13 per cent. of the total deaths. It was the principal cause of death amongst every race except the Europeans. As regards the cause of this disease, all authorities are agreed that it is an infectious disease; but there is a divergence of opinion on the extent to which it is preventible. Parkes and Kentwood, for example, state that "so far as has been ascertained, neither meteorological nor insanitary conditions appear to exercise any marked influence in the epidemic prevalence of pneumonia." Osler states that in America it has shown a decided increase, and in some places, *e.g.*, in Chicago, it has gradually replaced phthisis as the principal cause of death. He records the fact that in America it is more fatal amongst coloured than amongst the white people, an observation which equally applies to Ceylon. It is more common in cities, and individuals who are much exposed to hardship and cold are particularly liable to it, *e.g.*, the Tamils and "Others," whilst debilitating causes of all sorts render individuals more susceptible, alcoholism being a particularly predisposing factor.

Notter and Firth state that "insanitary conditions, especially filth, overcrowding, and want of ventilation act apparently as powerful, though not indispensable, predisposing causes." It is difficult to see what can be done to check the spread of this disease here beyond improving the general sanitary conditions of the town, as indicated in the sections dealing with housing and phthisis prevention.

(*c*) *Bronchitis.*

Deaths, 270; death-rate, 1·26 per 1,000; average for preceding ten years, 1·26; increase, *nil.*

8.—Diarrhœal Diseases.

Deaths, 959; death-rate, 4·57 per 1,000; average for preceding ten years, 5·98; decrease, 1·41 per 1,000.

This group includes diarrhœa and enteritis (which are for all practical purposes synonymous) and dysentery.

One of the most noteworthy points in regard to the mortality from this group is the great preference which practitioners have of late years shown for the term "enteritis" rather than that of "diarrhœa." The two terms are for all practical purposes synonymous; but whereas ten or fifteen years ago nearly all these cases were returned as diarrhœa, they are now mostly being returned under the heading of "enteritis." During 1901, for example, out of a total of 681 deaths returned under those two headings, the proportions

were diarrhœa 669 deaths, enteritis 12 deaths, whereas in 1911, out of a total of 696 deaths, the proportions were enteritis 520 deaths and diarrhœa 176 deaths.

(*a*) *Diarrhœa and Enteritis.*

The persistently high death-rate from this cause amongst the Tamils is noteworthy. No doubt poverty and exposure to hardships of the large Tamil beggar population has a good deal to do with this, as in the case of pneumonia; the consumption of contaminated and unwholesome food is an important factor in the causation of this disease.

(*b*) *Dysentery.*

Deaths, 263; death-rate, 1·32; average, 2·07; decrease 0·75 per 1,000. The mortality from this cause, although slightly higher than in 1910, has greatly decreased.

The Europeans, as usual, were the heaviest sufferers from this disease, dysentery and enteric fever being the two diseases from which they suffer more than any other cause.

9.—Fevers.

Deaths, 490; death-rate, 2·29 per 1,000; average for preceding ten years, 2·46; decrease 0·17. Of the total deaths registered from fevers 58, or 11·8 per cent., were deaths of non-residents of Colombo which occurred in hospitals. In other cases reported from the town no doubt the infection was acquired outside, but developed in or was brought to and reported as from Colombo, just as no doubt in some cases persons infected in the town died in the country. The heading "Fevers" includes enteric, simple continued, remittent, and intermittent fever.

Intermittent fever (malaria), which used to appear in the returns as a cause of death, has completely disappeared, there having been no deaths ascribed to that cause during 1911. Remittent fever (malaria) has also to a large extent disappeared from the returns. This bears out what I have frequently remarked, that there appears to be very little primary malaria in Colombo. One sometimes hears it stated that "seven-day fever," of which there has recently been a great deal in Colombo, is a form of malaria, but there is no evidence at present so far as I can gather in support of this.

(*a*) *Enteric Fever.*

Cases reported, 1,149; deaths registered, 396; death-rate, 1·85 per 1,000; average death-rate for preceding ten years, 1·18: increase, 0·67; case-rate per 1,000 living, 5·70; case mortality, 38·9 per cent.

Eight hundred and eighty enteric-infected houses were disinfected and 185 filthy compounds were cleansed, while 354 cases with a mortality of 21·7 per cent. were treated in the enteric hospital.

The case mortality for the town quoted above, viz., 38·9 per cent., clearly indicates that many non-fatal cases must have escaped recognition and notification, for the true case mortality in Colombo is almost certainly not more, and is very probably less, than 12 per cent. The Europeans, who suffer from this disease more severely than any other race, and amongst whom diagnosis and notification of mild cases are no doubt more accurate and complete than in any other race, had a case mortality in 1911 of 12·9 per cent. Probably a large number of the unrecognized mild cases occur amongst children.

There can be no doubt that the enteric rates for most of the indigenous races, but especially for the Malays, are far from correct.

Owing to the infection being so widely implanted here, the possible sources are so numerous, and the channels whereby it may gain access are so obscure and devious, that it is impossible to state with any degree of certainty which are the most usual. There are, however, one or two so well known and so obvious that they may with certainty be specified.

(1) *Direct Contact with an Infected Case.*—This would include contact, not only with those known to be suffering from the disease, but also with unrecognized cases, and with carriers. The latter two are the most dangerous by reason of their true nature being concealed, the result being that no precautions are adopted.

It is a source which is not by any means confined to the poorer classes, several instances having occurred amongst the well-to-do and educated classes, in which there was more than a suspicion that infection had been acquired by direct contact with an infected relation or friend. No one should be allowed to leave the room of an enteric patient, whether at home or in the hospital, without washing and disinfecting their hands.

(2) *Infection from Latrines.*—Infection may be acquired in this manner either by direct contact with the infected matter in the latrine, or through the agency of flies which have visited the latrine for the purpose of laying eggs. The latter is, I believe, one of the most fruitful sources of infection in Colombo. It is a source which can only be effectively prevented by the abolition of the bucket latrine and the institution of the water-carriage system instead.

The extraordinary indifference and carelessness of even educated householders in the matter of these latrines may be gathered from the fact that during a recent inspection of most of the houses in the Cinnamon Gardens, although the house latrines were all right, in only five out of a total of 225 premises visited was it found that any sort of covering was used for the contents of the buckets in the servants' latrines, most of which, be it noted, are situated within a few paces of the back veranda and of the house kitchen. It is no wonder, under such circumstances, that when the fly season comes round enteric fever breaks out every now and then and spreads amongst these houses.

It is of interest in this connection to note that out of 900 cases of enteric investigated last year, in no less than 801, or 89 per cent., there were badly kept bucket latrines on the premises.

(3) *Milk.*—Contaminated milk is a probable source of infection in some cases, especially where, as in Colombo, the milk is known to be frequently adulterated. There has, however, been an extraordinary improvement during the last few years in the matter of milk adulteration.

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Epidemics caused by milk have, as a rule, certain definite characteristics, none of which have been met with here during recent years. The only conclusion one can draw from these facts is that, if the information supplied is correct, although milk is a possible source, especially if used unpasteurized or unboiled, it is not, as matters stand, a very common source of enteric in Colombo. On the other hand, as the result of a good many years' experience here in the matter of collecting information, the replies given to the sub-inspectors as to the use of milk are by no means reliable, and therefore one must keep an open mind in regard to the degree in which milk is a source of infection here, and must omit no precaution in this respect.

(4) *Water.*—Another possible source of infection is through contaminated water, *e.g.*, foul wells and bathing places. How far infected water from wells and such like is a source of infection here it is impossible to say, but the town water has been shown by repeated examinations to be above suspicion.

(5) *Dust.*—Infected dust is a possible, but a probably extremely rare, source of infection.

(6) *Indirect Contact.*—This may be a source of infection by handling infected clothes, &c., but, crude although the dhobie's methods are, I do not think he probably often is responsible for the spread of enteric.

In conclusion, the chief sources of infection by enteric here are probably direct contact and badly kept bucket latrines. The former can best be met by segregating all cases in hospitals, the latrine source can only probably be dealt with by the abolition of the bucket system and the introduction of the water-carriage system, pending which householders must protect themselves and their neighbours by using coir dust in their latrines, fly-proofing their kitchens and latrines, boiling milk, covering up food, and such like.

As it will be many years at the present rate of progress before the water-carriage will have completely displaced the bucket system, it behoves those who are specially susceptible, *e.g.*, newly arrived Europeans, to further protect themselves by being inoculated against enteric. In view of the remarkable results which have been obtained in India and elsewhere by this method, it strikes one as little short of folly not to take advantage of it. It is such a trivial operation, less painful as a rule than vaccination. I think firms who are responsible for the importation of young Europeans should insist in every instance upon their being inoculated prior to leaving England. Such a policy would probably save a lot of inconvenience and money, not to speak of young lives, so many of which this disease has been responsible for cutting off in the past.

I have already recommended that the Council should adopt such a policy in regard to its own employees, and I understand the suggestion has been favourably received.

(*b*) *Simple Continued Fever.*

Deaths, 45; death-rate, 0·21 per 1,000; average rate for preceding ten years, 0·58; decrease, 0·37; cases notified, 71. It is impossible to say what the true cause of the 45 deaths ascribed to simple continued fever was; some of them were probably enteric fever.

(*c*) *Remittent Fever.*

Deaths, 49; death-rate, 0·23 per 1,000; average rate for preceding ten years, 0·69; decrease, 0·23.

A quarter of these deaths were in Slave Island, no fewer than eight of them being amongst Malays. When it is considered that whereas the term "remittent fever" as commonly used implies malaria, and that Slave Island, where most of the Malays live, is distinctly a non-malarious district, it is a significant fact that the Malays should be the only race which continues to have a high mortality ascribed to this cause. There can be little doubt that these deaths were in reality due to causes other than malaria, many of them being probably due to enteric fever.

(*d*) *Intermittent Fever.*

This has entirely disappeared from the returns as a cause of death. The great reduction in the mortality ascribed to remittent fever, and the entire disappearance of intermittent fever from the returns, bear out what has been previously maintained, that except for small occasional outbreaks on the outskirts of the town, there is practically no primary malarial infection in Colombo.

(*e*) *Seven-day Fever.*

Although this is not a notifiable disease, inquiries show that there have of late been a good many cases in Colombo. Its specific cause has not yet been ascertained; but there appears to be a growing suspicion that it may be spread by the bite of a mosquito. Whether this is so, whether the virus is ingested, or gains access in some other way, has not yet been ascertained.

10.—Infectious Diseases Notification.

(*a*) *General.*

The notifiable infectious diseases are plague, cholera, smallpox, chickenpox, measles, scarlet fever, diphtheria, acute or choleraic diarrhœa, enteric fever, simple continued fever of seven days' duration or over, and, since January 1, 1910, phthisis.

(*b*) *Cholera.*

Nineteen cases were reported from the town and two from the port; all proved fatal except two. In twelve of the cases a bacteriological examination was made with a positive result in each. The outbreak commenced at Ragama camp, and spread from there to the town, the first two cases which occurred in the town having been employed as sweepers at the camp. The town cases were spread over a period extending from May 26 until July 27. All the cases except one were males. The largest number of cases occurred at the 20 to 25 age period.

(*c*) *Smallpox.*

Sixty-five cases were reported, of which 36 were from the town, 20 from extra-urban districts, and 9 from the port. There were 8 deaths in all, repre-

senting a case-mortality of 12·3 per cent., which is a low case-mortality, and indicates that the community is fairly well vaccinated. The first infection was, as usual, imported from India, the patient having arrived as a deck passenger *via* Tondi, which was at that time an open port, quarantine having been imposed in the case of only Tuticorin and Paumben.

Vaccination.—17,325 vaccinations were performed during the year, of which 8,310 were primary and 9,015 were secondary. As there were only 5,280 births registered during the year, the figures quoted above include a number of primary vaccinations of persons over one year of age; but a proportion of the discrepancy is no doubt due to the vaccination of children who, although born of Colombo parents, have been born in districts outside the town, from whence they have been brought into Colombo and been there vaccinated.

(*d*) *Chicken-pox.*

There were 934 cases reported from the town, 71 from extra-urban districts, and 10 from the port. One death was ascribed—probably erroneously—to this cause.

(*e*) *Measles.*

There were 330 cases reported from the town, 17 from extra-urban districts, and 6 from the port. Four deaths were ascribed to this cause.

(*f*) *Diphtheria.*

Twelve cases were reported from the town, there being 4 deaths, representing a case mortality of 33·3 per cent., which is very high, and probably indicates that a number of mild non-fatal cases escaped recognition and notification.

(*g*) *Acute Diarrhœa.*

Nineteen cases were reported from the town. The death returns do not discriminate between acute diarrhœa and simple diarrhœa.

11.—Housing.

(*a*) *General.*

The problem of housing in Colombo is one which, as the result of many years of legally uncontrolled and consequently indiscriminate and insanitary erection of buildings, has now become so pressing that, in the interests of public health, action can no longer be safely deferred. These remarks have reference not to the mere insufficiency of house accommodation, which is being keenly felt by all classes, but to the question of improving the existing and preventing the creation of new unhealthy areas and unhealthy dwellings, which latter has been for years, and is now, going on so rapidly in Colombo, and is seriously affecting the health, especially of the poorer and more numerous section of the population. It is not, however, the health of only those residing within these unhealthy areas which is affected, for there being constant communication between the quarters of the poor and those of the well-to-do, through servants, tradesmen, &c., many of the diseases which are bred and fostered in the poorer quarters—*e.g.*, enteric, phthisis, &c.—cannot be restrained within such limits, but make excursions from there into the dwellings of the well-to-do, whose death-rate is also thus maintained at a higher level than it otherwise should be.

For confirmation of this one has only to look at the death-rates of the various races in Colombo, where it will be seen that the Europeans and Burghers, types of two classes who more than any other live outside the unhealthy areas, have nevertheless had average death-rates during the recent decade of 29·6 and 26·3 per 1,000 respectively—rates which, though not so high as those of the poorer races, are higher than they ought to be, and higher than they no doubt would be if a large part of the poorer population were not living in comparatively close proximity to them in unhealthy areas. Action taken, therefore, with a view to protecting the poorer classes from the evil effects of living in unhealthy dwellings and unhealthy areas would also have an effect in relieving the whole population from a situation which has for many years been steadily, and during recent years has been rapidly, increasing in danger.

(*b*) *Unhealthy Areas.*

Although the unhealthy dwelling is the unit of the unhealthy area, and the two subjects are therefore intimately associated, it is usual to deal with them separately, especially in the matter of legislation.

In Colombo there are no laws for dealing with unhealthy areas, and consequently practically nothing has been done to improve matters in that respect. It is true that the widening of Churchyard Lane (now Short's Road) and of Panchikawatta (now part of Skinner's Road) has effected a local improvement in these districts; but, as no provision was made for re-housing the poor people so displaced, as required by all modern improvement schemes, these people have merely been driven from one place to another, which in turn they have helped to overcrowd and render more unhealthy. The result cannot, therefore, be considered a gain to the town as a whole from a sanitary point of view. These road widenings have benefited traffic more than sanitation, and were indeed carried out primarily in the interests of traffic.

Not only has practically nothing been done to improve the existing unhealthy areas, but, owing to the lack of control over the erection of new buildings, the old unhealthy areas have been steadily increasing both in size and number, particularly during recent years, when something of the nature of a building boom has been in progress.

The whole problem of housing must be carefully considered, ways and means must be devised, and a regular programme must be drawn up and followed out.

It is my belief that the only practical way to effect this is to follow in the footsteps of places like Bombay and Calcutta, and to create an Improvement Trust for the city. The longer action in this matter is deferred the greater will be the cost to the ratepayers.

(*c*) *Unhealthy Dwellings.*

This question, as will be seen, is intimately associated with the question of unhealthy areas, which are merely aggregates of unhealthy dwellings. There is a vast amount of improvement work urgently

requiring to be carried out in connection with unhealthy dwellings, and it is in my opinion most necessary that the staff of the Inspector of Private Buildings should be increased.

(*d*) *House Accommodation.*

The rapid growth of the population of Colombo during the recent decade, amounting to 36 per cent., has resulted in an insufficiency of house accommodation, which is being keenly felt by all classes. The comparatively sudden increase in the prosperity of the island during recent years has, as might be expected, been particularly felt in Colombo. Firms whose business has suddenly increased have had rapidly to augment their staffs of assistants, clerks, and servants of all kinds. The increased demand for labour has in turn been responsible for an increase in the rate of wages. This again has attracted people to Colombo, not only from all parts of the island, but also from India and elsewhere. Not only so, but during the last few years an extraordinary number of large public works have been undertaken in Colombo, which again have attracted large numbers of people to the town.

The result of all this is a rather sudden and far from healthy congestion of population, in consequence of which house accommodation has become more and more scarce, and rents have gone up, the result being that every owner of a few feet of land has been tempted to run up a building in the hope of sharing in the increased prosperity. Many obstructive buildings have thus been erected, which, in the absence of proper building laws, the officers of the Council have been powerless to prevent, although they have done their best to do so. Another effect of this rapid increase of population is that it has encouraged what has now become an irrepressible tendency towards overcrowding, especially in the poorer quarters. All this development of property would, if it had been controlled by proper laws, have greatly improved the condition of the town, instead of which, it has been responsible for a steady, and even rapid, retrogression, the evil effects of which have been counteracted only by the success of the efforts of the Council's departments in other directions.

12.—Food.

(*a*) *General.*

One thousand and eighty-three, or nearly 15 per cent. of the total deaths registered in Colombo during the year 1911 were ascribed to diarrhœa, enteritis, and dysentery — diseases which are known to be closely associated with the consumption of unwholesome and contaminated food, and yet Colombo, unlike other towns in the East, has no special staff for carrying on the important work of food inspection. The town is in exactly the same position in regard to this matter as it was ten or for that matter twenty years ago, all the food inspection having to be carried out by the sanitary inspectors, who have a multiplicity of other duties to perform, and can therefore only give a very limited and entirely insufficient amount of time to food inspection.

(*b*) *Tinned Food Stuffs.*

The huge scale upon which tinned milk is used will be seen from the fact that during the twelve months extending from June, 1910, to July, 1911, 1,732,560 tins were imported into the island. A certain amount of it is of inferior quality, and far short of fresh cow's milk in nutritiousness and digestibility. Some of it is made from skimmed milk, although that fact is not declared upon the label, and the directions for dilution are frequently such that, if carried out, a mixture will be produced which is far below the Colombo standard for pure milk. This is most unfair to the local milk dealer, who is punished every time he sells milk below the standard.

Not only milk, but also large quantities of butter, fish, beef, and mutton are also imported in tins, and I would repeat my recommendation that the date of filling at the factory should be clearly impressed upon each tin, failing which it should be liable to seizure.

(*c*) *Bread.*

The inferior quality of the Colombo bread is a frequent source of complaint, and several bakers were interviewed on the subject with a view of finding out if possible what the explanation was. The following were the facts elicited.

The quality of bread depends mainly upon two things, viz., the quality of the yeast and the quality of the flour. The best bread is made with toddy yeast, the price of which varies from Re. 1.50 per lb. during the months of January to April to 50 cents during the months May to December. It takes about 1 lb. of yeast to make 50 lb. of bread. Bread made with hops, yeast and potatoes goes sour very quickly in the Tropics. The quality of the bread is often affected by bakers adding various things to the yeast with a view to economy, but the best bread is made with pure toddy yeast, which must be fresh. The cheaper yeasts are more liquid, have a sour smell, and a dirty grayish appearance.

The best flour is Trieste flour, which costs Rs. 30 per bag; next comes Bombay superfine at Rs. 15; then Bombay flour at Rs. 13; and a still cheaper variety at Rs. 12. The better the flour is the whiter and better the bread is. Alum does not appear to be used here as an adulterant. Trieste flour is too expensive, and none of the bakers use it. It has been tried, but does not pay, as a one-lb. loaf costs 28 cents, as compared with 14 cents, the price of a loaf made of Bombay superfine flour. It would not pay to use Trieste flour unless 600 lb. of bread per day were guaranteed. These are the facts supplied to me by one of the leading bakers.

(*d*) *Milk.*

The extraordinary improvement which has been effected, as the result of the action taken by this department during the last few years in respect of the milk supply of the town, is shown by the fact that whereas in 1907, 73 per cent. of the samples examined were adulterated, only 17 per cent. were found adulterated in 1911. The 1911 figures are based upon the examination of 1,087 samples, which is the largest number ever dealt with.

13.—Water.

(*a*) *Town Water.*

Although no pathogenic or even suspicious germs have ever been found in the Colombo water, which has always been pronounced good and wholesome by the City Analyst, a rather high bacterial count has at times been observed, and it contains too much suspended matter, which rapidly deposits upon and occludes the iron pipes. The Municipal Engineer and I were deputed by the Council to visit and report upon the Jewell system of filtration in Bangalore, and as a result of our inquiries we recommended that it should be adopted in connection with the Colombo water supply.

(*b*) *Wells.*

The dangerously polluted condition of the wells in Colombo is shown by the fact that out of fifty-six samples examined fifty-two were found to be dangerously polluted.

Twenty-two wells were closed during the year.

(*c*) *Liquor.*

One further point which calls for remark is that copper continues to be found in arrack, sometimes in large quantities. The whole liquor question is at present the subject of a Government Commission.

14.—Public Markets.

(*a*) *Buildings.*

There is little improvement to record in this respect, the reconstruction of Dean's Road market being still far from completion. A large central market, on the lines of the one at Bombay for example, is badly wanted.

(*b*) *Administration.*

A considerable advance has recently been effected in this respect by the appointment of assistant market-keepers and additional coolies. These men took up duties only on March 1 of this year.

15.—Slaughter-house.

The sanitary condition of the slaughter-house buildings, apart from minor defects in the matter of repairs, is fairly good; but the arrangements for the disposal of the drainage, which contains much blood, and creates a fly-breeding nuisance in the neighbourhood, remains the same. The extension of the sewers, so as to receive the liquid waste from the sheds, is the only satisfactory solution of the difficulty.

The returns of animals slaughtered show an increase of 2,302 in the number of cattle slaughtered, but a decrease of 331 pigs and 20 sheep or goats. 728 animals were rejected on account of their being too old and wasted, which is a reduction of 143 compared with the 1910 figures. The Superintendent has been instructed to be more strict in this matter, as it was found that many animals were being passed which were much too thin to be put upon the meat market. The quality of the meat in Colombo is exceedingly poor, and it is only by rigorously rejecting old and wasted animals that it can be improved—a task which, however, the Superintendent appears to find some difficulty in carrying out.

16.—Registered Trades.

(*a*) *Dairies.*

The condition of dairy premises in Colombo, although much improved in some respects, is far from satisfactory. The fact of the matter is that a dairy is a very difficult business to conduct properly. It involves a considerable initial expenditure, and thereafter incessant supervision over the workmen by the owner or manager.

The registration of four dairies was cancelled during the year 1911, and five new premises were registered, leaving thirty-eight dairies on the register at the end of the year.

(*b*) *Bakeries.*

There were fifty-six bakeries on the register at the end of 1910, four were discontinued, and four new ones were registered during 1911, leaving fifty-six on the register at the end of the year.

The following are the chief conditions required. The bakery should not be situated in an insanitary area, but this cannot be insisted upon so long as the bakery itself and its immediate surroundings are in order. It must not be in a position where foul smells from latrines and such like can reach it. Where the sewers are available, a latrine must be provided for the workmen; but where the sewers are not available, the latrine must be at some distance, and disconnected from the bakery.

The bakery must be well lighted and ventilated, particular attention being paid to the ventilation. It must also be protected as far as possible against undue heat, as otherwise the workers perspire too freely when at work. To secure this the oven is where possible disconnected from the kneading room by an unroofed yard or space, only an open sided roofed air passage for the workers being allowed between the oven and the kneading room.

The floor and the walls to a height of 5 ft. must be cemented, the rest of the walls being limewashed. A tap, with a basin, soap, and clean towels must be provided for the workmen, who must wear clean white aprons covering the whole of the front of their bodies. The kneading tables must be kept in good repair, free from gaps between the boards, and must be kept scrupulously clean. No unnecessary articles must be kept in the kneading room. Spitting is strictly prohibited in the kneading room or on the passages.

Unless not more than one day's supply of flour is kept upon the premises, there must be a separate flour store, with cemented floor and a bench upon which to keep the flour sacks. This store must be properly ventilated. The bread baskets must be kept clean.

These requirements are, upon the whole, well carried out, the bakers being much better as a class to deal with than the dairymen.

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(*c*) *Laundries.*

There were 235 laundries on the register at the end of 1910; 25 were discontinued and 63 new ones were registered during 1911, leaving 273 on the register at the end of the year.

The laundry trade in Colombo is most unsatisfactory. There is not a single laundry in Colombo which can be considered satisfactory. Where pipe water is used, as in the case of the Racquet Court laundries, the dhobies are too sparing with the clean water, batch after batch of dirty clothes being washed in the same water, until it resembles soup rather than water. It is true that the clothes are, as a rule, ultimately passed through clean water, but it is doubtful whether the filth is thus properly removed. The clothes frequently look clean enough and white enough; but they have seldom the proper clean smell, which is the test of properly washed clothes. The clothes which could stand such a process, and most of the things sent to the dhoby here could do so, are neither boiled nor even washed in hot water.

The amount of clothes washing which has to be done in the Tropics is greatly in excess of what is required in temperate climates, and therefore the rates must be lower here, unless people are able to afford a heavier dhobies' bill. Low rates, on the other hand, will probably not make it possible to run a aundry on up-to-date lines.

There thus seems to be no solution of this problem, except to have two standards, one for the ordinary dhoby, and the other for first-class dhobies. Here, however, success is dependent upon the customers, for unless they are prepared to make it worth the dhobies' while to comply with the higher standard, no dhoby will embark upon the undertaking. A dhoby once told me that if he were guaranteed a sufficient number of customers he would undertake to establish an up-to-date laundry, but he added that a laundry on Western lines had been tried before in Colombo and failed through lack of support. Needless to say, if any guarantee of this sort is to be furnished, it must be by the customers themselves. I see no hope of seeing really up-to-date laundry methods being adopted here, except as the result of private enterprise backed up by the residents of the town.

(*d*) *Eating-houses.*

A large proportion of the working classes, and many of the clerks, take their midday meal in eating-houses, the number of which is consequently large, there being 287 upon the register at the end of 1911. These eating-houses demand a great deal of sanitary supervision, otherwise they tend to rapidly degenerate, as the customers are for the most part indifferent to the conditions under which their food is prepared and served, and it is consequently not worth the while of the eating-house keeper to trouble on their account about the niceties. There are, however, a number of better class houses, the number of which I am glad to say is increasing, where a considerable effort has been made to render them attractive to those with more fastidious tastes. It is largely a matter of experience or education. A person who has dined in a bright clean house will be more likely to notice and to resent eating in a badly kept one, and consequently the larger the number of good houses there are the greater will be the number of those persons who, having experienced the better conditions, will avoid the badly kept houses. Some of the eating-houses are kept in quite a creditable condition.

(*e*) *Offensive and Dangerous Trades.*

Under this heading come manure depots, soap manufactories, hide stores, dyeing houses, cotton stores, straw depots, timber depots, and aerated water factories. The supervision over the dangerous trades enumerated above, with the exception of the aerated water factories, might more properly be under the Superintendent of the Fire Brigade than the Medical Officer of Health.

17.—Cemeteries.

The whole of the cemetery has now been surveyed and a new plan prepared, upon which the ground is marked out in systematic blocks, plots, and paths. The work of marking in the existing graves, the older ones of which are not in accordance with any systematic method of alignment, is now engaging the attention of the assistant keeper, who was specially selected for his knowledge of survey work. All new graves are being dug in accordance with the new plan, except in a few instances, where this is impossible owing to the irregular disposition of old graves. The head gardener has planted a considerable number of shrubs and flowering trees, especially flamboyants, which should in time greatly improve the appearance of the cemetery. The introduction of a water service has greatly facilitated the keeping of plants in condition.

18.—Work Statements.

(*a*) *Sanitary Inspectors.*

The experience of every year demonstrates the necessity for employing a Chief Sanitary Inspector, as is done in other towns. Nowhere is this want more felt than in the conduct of prosecutions in the Municipal Court, where many cases are lost purely as the result of unskilful handling by the inspector. This is no more than is to be expected, where, instead of having one trained man to examine, arrange, and present the evidence in every case, each one of the thirteen inspectors has to work up and conduct his own cases. If all the prosecutions were conducted by one Chief Inspector, he would in time become an expert in municipal law and procedure, and the Council would probably be saved a considerable amount of money, which they now have to spend in lawyers' fees, while the public would be saved from what are sometimes made to appear as unnecessary and harassing prosecutions, for a prosecution which is entered, and as the result merely of unskilful handling ends in acquittal, does a great deal more harm than good, and fosters in the minds of those who have been so prosecuted the feeling that they have been unjustly dealt with in being prosecuted at all.

There can be no doubt that the appointment of

a trained Chief Sanitary Inspector, whose character should be above suspicion, and who should sift all the evidence put forward by the Sanitary Inspectors, and conduct their prosecutions, would go a long way to improve matters. What is required is a man with a good moral character, a strict disciplinarian, one trained in sanitary work, and with no local ties or connections which might influence him, or be alleged to influence him, in the discharge of his duties, and who has not, either rightly or wrongly, been the subject of suspicion as to his methods of procedure.

(*b*) *Sub-Inspectors.*

The work of the sub-inspectors comprises inquiring into and taking action in respect of enteric fever and phthisis. During the year 1911 they supervised the disinfection of 880 fever infected houses and 364 phthisis infected houses, making a total of 1,244 houses disinfected, which, together with the 787 disinfected by the Sanitary Inspectors, makes a total of 2,031 houses disinfected during the year.

(*c*) *Enteric Cleansing Gang.*

This gang consists of an overseer and four coolies, whose duty it is to cleanse and disinfect compounds and latrines which are either enteric infected or are so filthy that the ordinary procedure of serving notice upon the occupant cannot be awaited. Four hundred and forty-seven infected latrines, &c., were so disinfected, and 185 filthy compounds were cleansed during the year.

(*d*) *Ambulance.*

The ambulance work was, as hitherto, carried out by the Fire Brigade, to the Superintendent of which I take this opportunity of expressing my thanks for the excellent manner in which the work has been carried out.

(*e*) *Disinfecting Station.*

This is in charge of an overseer, whose duty it is to receive, pass through the Equifex steam disinfector, and dispatch infected articles of clothing, &c.

One hundred and eighty-five loads, comprising 5,379 articles, were thus passed through the disinfector during the year.

(*f*) *Insect Pest Prevention Gang.*

This gang consists of an overseer and two coolies, whose duty it is to search out and deal with the breeding-places of mosquitoes and flies. Naturally such a small gang can only touch the merest fringe of this work which requires to be done in Colombo; but they are useful for dealing with complaints from householders in regard to mosquitoes. During the year 1911, 2,038 premises were visited, in 1,176 of which mosquitoes were found breeding, and their breeding-places were destroyed, the occupants being instructed how to prevent a recurrence, and warned that if they failed to do so they would be prosecuted; 90 notices to abate insect breeding were served; 494 pools, &c., were oiled, the quantity of oil used during the year being 172¼ gallons.

This most useful work of insect pest prevention is one which to be really effective requires to be taken up upon a vastly larger scale; but the lack of funds for other important purposes leaves little hope at present of the success of a recommendation in this respect. It is a matter, however, which must be dealt with before long, and I propose to do so later.

19.—Municipal Free Dispensary, Slave Island.

This, the first of a proposed series of municipal free dispensaries adopted by the Council, was opened in Church Street, Slave Island, in February, 1910.

The object of this dispensary is to supply skilled medical attendance to those who are too poor to afford the lowest fees accepted by private practitioners; to search out in their homes cases of sickness which are not under the care of a medical man; to advise in the matter of the care and feeding of infants, and in matters of domestic hygiene generally, with special reference to the prevention of phthisis; to supervise the work of the municipal midwife in the district.

The municipal midwife system was established prior to the establishment of the dispensary; but the Slave Island midwife has been attached to the dispensary, and is under the control of the medical officer, who checks her work, and where necessary deals with difficult cases.

20.—Municipal Midwives.

Six hundred and fifteen cases, representing 623 births, were attended by the six municipal midwives during 1911, there having been eight multiple births. This is slightly less than in 1910. There were 29 stillbirths and 19 deaths within four days, representing a death-rate (exclusive of stillbirths) of 2·89 per cent., which is slightly in excess of the 1910 rate. The numbers of male and female children born were 325 and 298 respectively. Burghers show a large excess of female, and Moors a large excess of male infants; other races show a fairly equal distribution of sexes.

21.—Municipal Enteric Hospital.

The Medical Officer reports that the buildings have been kept in good repair, but complains that the accommodation for the staff is insufficient, a remark with which I agree. During the year 1911, 354 cases were admitted for treatment, there being 77 deaths, representing a case mortality of 21·7 per cent.

A few minor operations were performed, and five *post-mortems* were held during the year.

The Medical Officer draws attention to the large number of cases sent in as enteric from other hospitals which are found to be due to causes other than enteric. This is, however, a usual experience in enteric hospitals all over the world, and is due to the great difficulty of diagnosing this disease, especially in the earlier stages, the usual remedy being a more frequent use of Widal's blood test.

Colonial Medical Reports.—No. 43.—Cyprus.

MEDICAL REPORT FOR 1910.

By ROBT. O. CLEVELAND.

Chief Medical Officer.

1.—Public Health.

The general health and sanitary condition of the island have been most satisfactory. There was no serious outbreak of infectious or contagious disease. Plague still menaced the island as in former years, and the outbreak of cholera in neighbouring countries caused anxiety, but fortunately the island escaped both these serious dangers, as no cases were reported throughout the year; the year under report in fact presents no special features, from a medical point of view, that call for remark.

Epidemic Meningitis.—A marked reduction in the number of cases of this disease is a pleasing feature. Eighty-four patients, as against 1,000 the previous year, are shown in the returns. The cases showed a milder form of infection, and there is every indication that the disease has assumed a sporadic form.

Malarial Fever.—Cyprus is unfortunately malarial, the disease receiving the local name of "Cyprus fever" until a few years ago, when the application of the microscope revealed its true nature. The three types, tertian, quartan and malignant fevers, were soon proved to exist in the island. The disease is fairly prevalent during the hot months of the year and in mild winters, cases are seen all the year round, their number varying considerably, being dependent largely on the rainfall, which if heavy during the warm months provides breeding-places for anopheles. During the year under report the disease was less prevalent than usual. There were 6,074 cases returned, against 7,450 in 1909, and 10,746 in 1908. The people are beginning to recognize the value of the various prophylactic measures recommended; the use of mosquito nets, improved sanitation, and quinine is becoming more general.

Typhoid Fever.—Generally speaking of a mild type, and only occurred in a sporadic form, although there was an increase of 66 cases on the returns of the year 1909, a total of 334 cases having been reported by the medical officers during the year under report.

Diphtheria.—Only 9 cases of this disease are recorded during the year.

2.—Institutions.

Hospitals.—The hospitals of the island show an all-round improvement in attendance and admissions. The total in-patients treated at the Government Central Hospital, Nicosia, and the five District Government-aided Hospitals was 2,201, with 125 deaths = 5·67 per cent. There were thus 141 more admissions than in the previous year. The out-patient departments of these institutions were also well attended, the patients numbering 23,859, an increase of 2,058 on the figures of the previous year.

A total of 298 surgical operations were performed, being an increase of 83 on the returns of the year 1909. To this total must be added 316 minor operations among out-patients.

The Central Hospital, Nicosia, the only purely Government Hospital in the island, has had a most successful year. The beds of this institution now number 53 and provide accommodation for men, women and children. There are wards for the treatment of both poor and paying patients. Medical, surgical, maternity, eye, and isolation beds now exist, and the general utility of the hospital is improving year by year.

Nearly 200 surgical operations were performed at this hospital alone. Patients from all parts of the island received the skilful and careful attention of an efficient and well trained medical and nursing staff.

In all the other district hospitals also advancements and important improvements have been made; among these the Larnaca Hospital, an institution built from funds raised by private effort and in great measure supported in the same manner, is noteworthy. The number of in-patients treated was 232 against 257 in 1909, and of out-patients 3,603 against 3,156 in 1909. Patients came from many towns and villages in that district and from others more remote. Useful structural additions were made during the past year, and an English nurse's services were secured in place of those of a native nurse. The hospital is well equipped as regards beds, bedding, instruments, and other arrangements for the comfort of patients.

The accommodation consists of a male ward of twelve beds, a ward for women of eight beds, four private wards, operating room, and the various offices connected with hospital administration. The hospital is devoted to the reception and treatment of the sick poor of the town and district both as in- and out-door patients. In special and urgent cases patients are admitted from elsewhere, and, as noted above, private paying patients are treated.

The returns of the twelve rural medical officers show that 10,461 patients were treated, a decrease of 1,354 on the returns of the previous year. The services of these officers are much appreciated by the inhabitants of the more remote towns and villages of the island.

The Leper Farm.—At the close of the year there were 99 inmates on the farm, and during the year there were 12 admissions. Fifteen inmates died. This mortality, although at a higher rate than in the last few years, is not exceptional in view of the terrible nature of the malady from which these unfortunate people suffer. Their lot has been considerably relieved by a substantial increase to the grant allowed them by Government.

RETURN OF DISEASES AND DEATHS IN 1910 IN THE SIX GENERAL HOSPITALS, LEPER FARMS, AND LUNATIC WARDS.

Cyprus.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	1	1	1
Anæmia	12	2	12
Anthrax	6	—	6
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	9	2	9
Delirium Tremens	1	—	1
Dengue	—	—	—
Diabetes Mellitus	2	1	2
Diabetes Insipidus	—	—	—
Diphtheria	6	3	6
Dysentery	24	1	26
Enteric Fever	44	8	53
Erysipelas	9	—	9
Febricula	36	—	37
Filariasis	—	—	—
Gonorrhœa	35	—	36
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	75	—	78
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	10	12	62
(*b*) Anæsthetic	12	3	52
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	136	—	137
Tertian	40	—	42
Quartan	7	—	7
Irregular	5	—	5
Type undiagnosed	178	2	180
(*b*) Remittent	9	—	11
(*c*) Pernicious	3	—	3
(*d*) Malarial Cachexia	—	—	—
Malta Fever	2	—	2
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	25	1	25
Malignant	18	1	18
Old Age	—	—	—
Other Diseases	2	—	2
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	14	—	16
Rheumatism	58	—	59
Rheumatoid Arthritis	—	—	—
Scarlet Fever	1	—	1
Scurvy	—	—	—
Septicæmia	4	3	4
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	—	—	—
(*a*) Primary	11	—	13
(*b*) Secondary	9	—	10
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	4	2	4
Trypanosoma Fever	—	—	—
Tubercle—	36	6	37
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	46	—	47
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	—	—	—
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	—	—	—
Eye	156	2	164
Generative System—	—	—	—
Male Organs	36	1	37
Female Organs	39	1	43
Lymphatic System	17	1	18
Mental Diseases	—	—	—
Nervous System	70	13	131
Nose	—	—	—
Organs of Locomotion	48	1	51
Respiratory System	492	44	516
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	3	—	3
(*f*) Other Diseases	72	—	73
Urinary System	31	3	33
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	1	—	1
(*c*) Other Injuries	265	12	277
Parasites—	—	—	—
Ascaris lumbricoides	1	—	1
Oxyuris vermicularis	1	—	1
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	1	—	1
Nature Unknown	—	—	—
Other Poisons	2	—	2
Surgical Operations—	281	—	285
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	4	—	4
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	13	—	13

Colonial Medical Reports.—No. 43.—Cyprus (*continued.*)

The subjoined table is of interest as it contains details regarding the inmates for the past ten years, and I should like to state, in this connection, that each year, on account of the extension of the Government Medical Service, and the increasing number of medical practitioners, fewer cases of the disease escape notice and segregation.

Cases of the three chief classes of this disease are seen, tubercular, anæsthetic and mixed, the tubercular exceeding the anæsthetic by 5 to 1.

Year	Inmates in the asylum on January 1	Admitted during the year	Deaths	Remaining on December 31		
	Inmates			Moslems	Christians	Total
1901	110	13	12	24	87	111
1902	111	12	13	23	87	110
1903	110	19	15	28	86	114
1904	114	6	9	28	83	111
1905	111	13	9	28	87	115
1906	115	3	19	24	75	99
1907	99	12	11	27	73	100
1908	100	7	5	28	74	102
1909	102	11	11	25	77	102
1910	102	12	15	25	74	99

No birth was recorded during the year. Two children still remained on the farm, being too young to be removed from their parents.

One child was admitted to the Home, there being eleven of both sexes thus removed from the farm, and it is of interest to report that in no case so far has any sign of the disease appeared. One death amongst them is recorded from chronic Bright's disease. Their education is receiving attention and they are being taught trades which it is hoped will place them in a position to earn their living.

The Lunatic Wards.—There were 20 cases of insanity admitted to the wards during the year; of these 18 were cases of dementia, 4 were suffering from acute mania, the remainder were cases of idiocy, delusional and epileptic insanity, and general paralysis of the insane.

Six inmates died during the year; 20 patients were sufficiently recovered to be released to the care of relatives or friends; at the end of the year 56 inmates remained under treatment.

Quarantine Department.—It was not necessary to impose quarantine during the year. The stations, and particularly that of Larnaca, were maintained in an efficient condition in readiness to cope with any emergency should the necessity arise, but nothing more than a careful medical inspection was imposed, and this was sufficient to protect the island from the importation of infectious disease.

Vaccination, although not compulsory, was extensively carried out. Fresh imported glycerinated vaccine was the medium used. Six thousand three hundred and thirty-two of these operations were carried out; of these 6,197 were primary vaccinations.

METEOROLOGICAL RETURN FOR THE YEAR 1910.

	Temperature				Rainfall		Winds	
	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force
January ..	58·2	38·4	19·8	48·4	3·59	80	W.	0·6
February ..	64·1	36·3	27·8	51·0	0·82	80	,,	0·2
March	63·1	36·4	26·7	51·1	3·73	76	,,	1·0
April	76·0	43·9	32·1	60·2	0·70	72	,,	0·2
May	85·6	51·3	34·3	66·9	1·02	68	,,	0·2
June	92 5	58·6	33·9	74·4	0·73	62	,,	0·4
July	99·0	63·2	35·8	80·4	0·00	58	,,	0·1
August.. ..	99·8	65·8	34·0	83·4	0·00	54	,,	0·4
September ..	91·8	63·1	28·7	77·6	1·85	78	,,	0·7
October ..	80·4	52·4	28·0	68·2	1·90	68	,,	0·3
November ..	71·6	44·3	27·3	58·4	0·14	76	,,	0·8
December ..	63·1	37·1	26·0	49·4	2·36	78	,,	0·1
Total mean ..	78·8	49·2	29·5	64·1	16·84	71	W.	0·4

Colonial Medical Reports.—No. 44.—New Providence.

MEDICAL REPORT FOR 1911.

By J. J. CULMER, M.R.C.S.Eng., L.R.C.P.Lond.

Acting Chief Medical Officer.

THE general health of the Colony throughout the year was good, no infectious or contagious disease having been notified to the Board of Health except nine cases of typhoid fever occurring in New Providence, with one death, a few sporadic cases of typhoid fever being reported almost annually.

The street drainage of the city of Nassau continues in an unsatisfactory condition, and until the drains in some of the streets are reconstructed no improvement can be expected.

The water supply from wells and cisterns has been plentiful.

The rainfall during the year was 40·15 in., an increase of 14·44 in. over the previous year.

Two hundred and sixty successful vaccinations were performed in New Providence during the year, and 2,956 on the various out island settlements.

RETURN OF THE STATISTICS OF POPULATION FOR THE YEAR 1911.

Number of inhabitants according to the census on April 2, 1911	55,944
Number of births since the last census	1,362
,, deaths ,, ,, ,, ...	867
,, immigrants	Not known
,, emigrants	
,, inhabitants in 1911	56,439
Increase	495

Return of Diseases and Deaths in 1911 in the Bahama General Hospital, New Providence.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	8	—	8
Anæmia	1	—	1
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	33	18	36
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	4	1	4
Enteric Fever	5	4	5
Erysipelas	2	—	2
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	23	—	23
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	10	2	10
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	3	—	2
(*b*) Anæsthetic	1	—	1
(*c*) Mixed	—	—	—
Malarial Fever—	12	—	12
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	30	—	32
Malignant	11	3	11
Old Age	—	—	—
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	2	2	2
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	7	—	7
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	8	5	8
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	—	—	—
(*a*) Primary	—	—	—
(*b*) Secondary	34	—	37
(*c*) Tertiary	21	7	26
(*d*) Congenital	9	2	9
Tetanus	2	1	2
Trypanosoma Fever	—	—	—
Tubercle—	59	26	69
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	19	—	19
Circulatory System	22	7	25
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	22	7	23
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	3	—	4
Eye	15	—	17
Generative System—	—	—	—
Male Organs	40	—	43
Female Organs	11	—	11
Lymphatic System	3	—	3
Mental Diseases	15	3	57
Nervous System	27	8	35
Nose	1	—	1
Organs of Locomotion	—	—	—
Respiratory System	8	2	10
Skin—	6	—	6
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
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,, Minor	—	—	—
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Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Colonial Medical Reports.—No. 45.—Federated Malay States.

MEDICAL REPORT FOR THE YEAR 1911.

By CHARLES LANE SANSOM.

Principal Medical Officer.

THE estimated population of the Federated Malay States as calculated from the Census returns of March 10, 1911, was 1,045,947, an increase of 44,690 persons over the number estimated for 1910, which was 1,001,257.

The total number of births registered was 20,310, the birth-rate being for the whole of the Federated Malay States 19·41 per mille of the estimated population.

Deaths.—The number reported amounted to 38,732, the death-rate per mille being 37·03 of the total estimated population.

Malaria caused 45·02 per cent. of the total deaths. There were 17,440 deaths from this disease, with a mortality-rate of 16·39 per mille of the living population.

Dysentery and diarrhœa accounted for 7,451 deaths —that is 19 per cent. of the total deaths, with a death-rate of 7 per mille of the total population. Thirty-nine per cent. of the total deaths were of persons in the prime of life—that is between the ages of 20 and 40.

The infant mortality was 170 per mille; 3,485 children died within twelve months of birth. This rate compares favourably with those of India and Burma, the provincial rate of infant mortality for Burma in 1910 was 233·24 per mille.

The number of in-patients in 1910 numbered 80,824. The death-rate for the year was 9·57 per cent.

The attendances of out-patients were 232,506, as compared with 217,407 for 1910.

In the Kuala Pilah district a travelling dispensary with a Malay dresser in charge was started in June.

The travelling dispensary boat was not at work for four months, as it was engaged on cholera duty, and thus the number receiving outdoor aid was not so large as in the previous year, a decrease probably enhanced to some extent by the opening up of estate hospitals.

Lunatics to the number of 990 were treated in the asylums; of this number 162 died; this includes 24 deaths from cholera.

There were 549 cases treated in the leper asylums; 130 lepers were transferred, and the erection of a temporary ward has relieved overcrowding in the asylum at Kuala Lumpur.

Every endeavour is made to lighten the burden of these unfortunate people; tobacco, fishing nets, and durians, when they are in season, are provided, and recently they were given a gramophone with records of Malay tunes, which was much appreciated.

The diseases responsible for the greatest number of admissions and deaths in the hospitals during the year are as follows: Malarial fever, beriberi, dysentery, diarrhœa, venereal diseases, tubercular disease of the lungs, other pulmonary diseases, ankylostomiasis, skin diseases, injuries, rheumatism.

The death-rate from malaria continued very high. There were in all 17,440 deaths in the whole of the Federated Malay States.

This malady has engaged the attention of all officers of the department, as well as others in the Government service. During 1911 the disease was more prevalent, and unless preventive measures are successfully carried out it is not unlikely, as the population becomes larger and traffic between the carrier and sufferer facilitated, the tendency to increase will be greater. The mortality figures alone do not convey a full knowledge of the amount of harm malaria causes; for instance, comparatively few Europeans or Eurasians die from it; but, on the other hand, a great many are repeatedly attacked, and not only is vitality lowered and resistance to other diseases weakened, but the pecuniary loss to the individual is considerable, and the total loss to the community and the Government is very great indeed. In fact, I do not think I should be guilty of exaggeration in saying that malaria is probably the most expensive luxury in the Federated Malay States. During the past few years several men have been persistently working at the malarial problem in this country, and sufficient information has been gathered together to warrant more energetic warfare against the malady. It has become obvious that preventive measures here cannot be limited to one procedure, because several varieties of mosquito which are carriers exist in various parts, making use of their own particular breeding-places, and a method of extermination which would be successful in one place would be a complete failure in another.

The dissemination of correct information is of no small importance. It is felt that systematic diffusion of knowledge regarding this enemy of man, its habits, the harm it does, and how to exterminate it, will not only encourage the individual to do his share, but also facilitate the efforts of local bodies and probably make them more effectual.

Dr. Freer, Senior Medical Officer, Selangor, Negri Sembilan and Pahang, reports that malaria is on the increase in Selangor, due principally to the continued opening of rubber estates and to the influx of immigrants of all nationalities arriving at Port Swettenham, to the number of 117,200 in 1911 as

against 93,544 in 1910. In Selangor and Negri Sembilan malaria was very prevalent during May, June and July in all parts, and that the Coast districts suffered most in September and October.

Dr. Fox, Senior Medical Officer, Perak, reports three cases of blackwater fever, being the first ever admitted into the Officers' Ward at Taiping, one of which ended fatally. In Selangor there were five cases of blackwater fever, with two deaths; and in Negri Sembilan two cases occurred, both recovered.

Seven thousand and twenty-one children were examined for enlarged spleen, the percentage affected being 20·19.

In the Kuala Pilah district of Negri Sembilan a systematic examination of the children for enlarged spleen was made by Dr. Hennessy in June and December of the year under review, and out of 1,237 examined in the latter month 305 were found with enlarged spleen, and of the blood examination of 1,091 children, 115, or 10·54 per cent., had parasites in their blood while attending school.

Free distribution of quinine to the poorer classes was continued in all the States during the year. In Perak quinine in the form of capsules, weighing 181 lb. 11 oz. 5 dr., was distributed free.

There were 6,042 cases of beriberi treated in the various hospitals, with 695 deaths.

In Perak there is a slight diminution since last year, but in Selangor and Negri Sembilan an increase has occurred.

The fact that a diet chiefly composed of white polished rice causes beriberi has received further confirmation, and several efforts have been made to make this generally known. Government has had under consideration several proposals for preventing or limiting the use of an unsafe rice, but the matter is a very difficult one to tackle.

A very important detail, which is part and parcel of any legislative interference with the sale of rice, is the effect on prices, and it is probable that no one could foresee exactly what would be the result if Government attempted to regulate trade in rice.

Certain ways in which the consumption of a safe rice might be encouraged have been under consideration, and it is probable that by giving every possible facility for manufacture, transport, and sale of it some good may result.

There has been an increase of 2,303 cases of dysentery and diarrhœa, with higher mortality compared with 1910, the three western States contributing towards the increase.

Cholera.—A serious outbreak of cholera occurred in Lower Perak in May, 1911: 342 cases were reported, with 237 deaths. Measures taken under the direction of Dr. Clarke, Medical Officer, Lower Perak, against the spread of the disease were effective.

In Krian the outbreak was peculiar, inasmuch as there were three recrudescences during the year, viz., in January, June, and October respectively. Altogether there were 199 cases, with 142 deaths.

Cholera appeared in the Lunatic Asylum, Taiping, in October, and the last case on November 15; 25 lunatics were stricken, with 20 deaths. The lunatic asylum being surrounded by a high fence rendered it possible to confine the infection within the asylum and prevent its spreading. Total cases treated in Perak were 582, with 411 deaths.

In Selangor, cholera broke out on July 15, with 14 cases, resulting in 12 deaths. Twenty-four cases occurred on rubber estates in the Coast districts. Prompt measures prevented any serious outbreak. Altogether there were 79 cases, with 63 deaths.

On the Island of Tioman it was reported that an epidemic, the symptoms of which appeared to be similar to those of cholera, was responsible for 22 cases, with no recoveries. Unfortunately, the medical authorities were not informed until all was over, the victims being all Malays.

Small-pox.—In Perak there were 81 cases, with 13 deaths. The small-pox epidemic which broke out in Taiping in August did not finally subside till February of this year.

In Selangor, 75 cases, with 6 deaths, were reported. The greater number occurred on rubber estates, mostly in the Coast districts, and wholesale vaccination prevented any serious spread. There were 125 cases, with 23 deaths, reported; in Pahang 5 cases, with 1 death, and at Kuala Lipis 2 cases, the source of infection being unknown.

Plague.—There were 5 cases reported. One died in the isolation ward at the District Hospital, Kuala Lumpur; and of the 3 cases admitted in the hospital at Seremban all proved fatal.

Chicken-pox.—There were 91 cases with no deaths.

Measles.—There were 151 cases reported. Of the 20 patients treated in the hospital there were 3 deaths, due to broncho-pneumonia, convulsions and fever, and 1 in Pahang.

Enteric Fever.—In Selangor 15 cases came under notice. Of the 5 cases admitted in the Kuantan Hospital, 3 died.

Diphtheria.—There were 2 cases in Selangor. In Negri Sembilan 7 cases were treated in hospital.

Filariasis.—This disease is comparatively rare in this country. Out of 700 blood examinations for filariasis made at the District Hospital, Kuala Lumpur, the embryos were found in 16 cases, or 2·28 per cent.

At Raub Hospital the blood of 1,034 patients was examined for the presence of filariasis, with a positive result in 4 cases only; none showed any symptoms of filarial disease.

Vaccination.

The table appended shows the work done and the results:—

State	Successful	Failed	Not verified	Total
Perak	20,992	3,585	24,181	48,758
Selangor	27,728	6,544	12,622	46,894
Negri Sembilan ..	6,636	1,005	177	7,818
Pahang	3,528	821	302	4,651
Total ..	58,884	11,955	37,282	108,121

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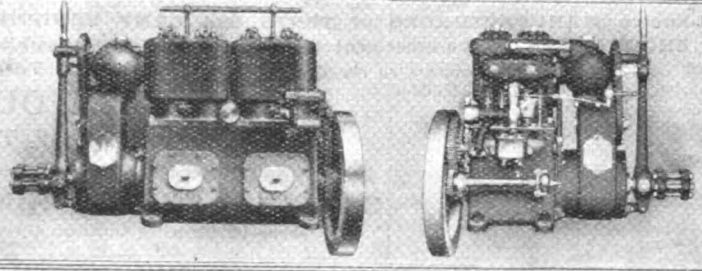
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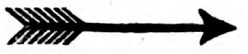
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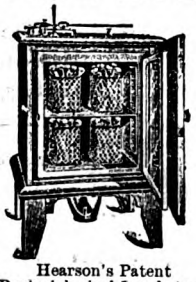
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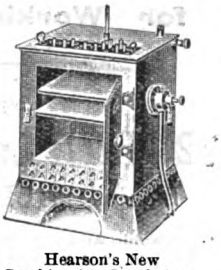
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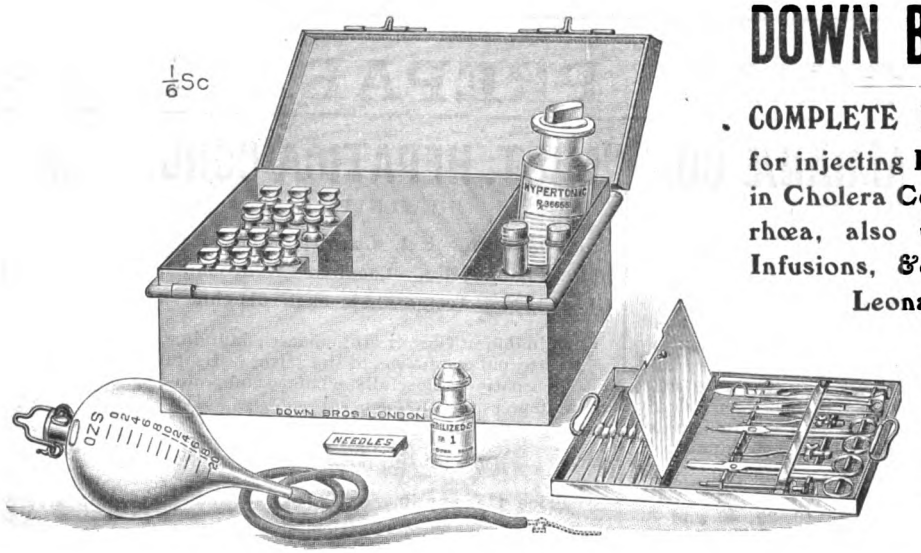
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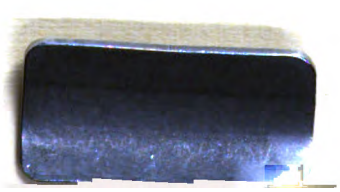
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